

## Sectional Meetings

Details of the technical section meetings follow. Section name, time and location of meeting, presiding officer, title of paper, and author, address and abstract are listed. See map for building locations.

Business meetings are scheduled for each section. An important item of business is the election of a Membership Chairman for the Section who automatically succeeds to the office of Vice President the following year.

### A. SECTION OF ZOOLOGY

MORNING SESSION, SATURDAY, APRIL 22, 9:00 A.M.

Bio Sci 103

Vice President, JOHN CRITES, Presiding

9:00

EFFECTS OF LOW TEMPERATURE AND TRAINING UPON PHYSIOLOGICAL REACTIONS TO HANDLING STRESS IN THE GOLDFISH. Ilze Picukans, Department of Biological Sciences, University of Cincinnati, Cincinnati, Ohio 45221.

When goldfish, *Carassius auratus*, acclimated to 20°C. are subjected to handling stress of lifting them from their aquaria for 15 sec., they respond with hyperglycemia and a decrease in hepatic glycogen levels but no change in osmolarity or electrolyte levels. The hyperglycemia due to glycogenolysis is not mediated by glycogen phosphorylase or  $\alpha$ -amylase. Acclimating *C. auratus* to 1°C. elicits a hyperglycemic state with an accumulation of hepatic glycogen, an increase in serum osmolarity and no change in electrolyte levels. The hyperglycemic stress response is not increased in magnitude in the cold. In the 1°C. acclimated fish, hyperglycemia is probably the result of gluconeogenesis. In the case of the 20°C. acclimated fish, accustoming the fish to handling by means of a daily training procedure abolished the stress induced changes, whereas in the 1°C. acclimated fish, the training procedure augmented rather than abolished the hyperglycemia.

9:15

CHROMOSOMES OF NORTH AMERICAN PERCID FISHES

Ted M. Cavender, The Ohio State University, Columbus 43210 and Michael R. Ross, University of Massachusetts, Amherst 01003

Karyotypic evolution within the North American Percidae is the focus of this study. Karyotypes were prepared of more than thirty species belonging to five genera: *Perca* (1 species), *Stizostedion* (2), *Ammocrypta* (1), *Percina* (6 in five subgenera), *Etheostoma* (23 in ten subgenera). All species showed a diploid number of 48. The percid karyotype is characterized by a high number of acrocentric chromosomes with measurable short arms. *Stizostedion* and *Perca* (subfamily Percinae) were very similar with 48 acrocentrics and a fundamental number of 48 (interpreted as the ancestral percid condition). The remaining genera (darters of the subfamily Etheostomatinae) differ in possessing at least one long submetacentric or metacentric pair. This chromosome pair (typically the longest) is interpreted as a derived character arising from a centromere shift via pericentric inversion (possibly a single event in the darter ancestor). Pericentric inversion as a mechanism of karyotypic evolution also explains the trend found within the Etheostomatinae toward an increase in fundamental arm number.

## ZOOLOGY

9:30

PROCEDURES FOR ESTIMATING THE NUMBER OF FISH IN LARGE COLLECTIONS WITH A PREDETERMINED DEGREE OF ACCURACY. George W. Sturm, Department of Statistics & Jeffrey M. Reutter, Center for Lake Erie Area Research, The Ohio State University, Col. OH 43210

It is often impractical or impossible to identify, enumerate, weigh and measure every fish in a collection containing hundreds of thousands of individuals, as is common at industrial cooling water intakes. However, the results of this effort (total numbers, mean lengths, mean weights, the corresponding standard deviations, etc) are ecologically very significant and warrant accurate determination. Consequently, field and statistical procedures were developed to allow rapid estimation of the number of fish of each species to be weighed and measured individually to estimate the above parameters, with a predetermined degree of accuracy. Only the total weight of the collection and the portion which is sorted by species need be known. To determine the number of fish to weigh and measure to estimate the total catch and the mean weight to within  $x\%$  of the true values, the following equation is used:  $y \left( \frac{y}{\sigma} \right)^2$ ; where, " $\sigma$ " (standard deviation of the individual weights) and " $\mu$ " (mean) are estimated in the field. If  $x=5, 10, 20$  or  $30\%$ ,  $y=1600, 400, 100$  or  $45$ , respectively. To estimate the standard deviation of the mean length or weight to within  $5, 10, 14$  or  $20\%$ , the number to be weighed and measured is  $800, 200, 100$  or  $50$ , respectively. Field procedures and equations were tested on 254 fish collections during 1976 and 1977 with excellent results. A logarithmic method which eliminated negative bounds on the confidence intervals for these parameters was also developed and tested.

9:45

COMPARISON OF ICHTHYOPLANKTON DENSITIES IN DAY AND NIGHT SAMPLES FROM LOCUST POINT, LAKE ERIE. Jeffrey M. Reutter and C. Lawrence Cooper. Center for Lake Erie Area Research, The Ohio State University, Columbus, Ohio 43210

On June 13 and 25, 1977 ichthyoplankton densities at four sampling stations near Locust Point were sampled several hours before and after sunset. Two 5-minute circular tows (3 to 4 knots/hr) with a 0.75-meter diameter heavy-duty oceanographic plankton net (No.00, 0.75 mm mesh) equipped with a flow meter were completed at the surface and bottom of each station on each date and time. Results indicated that the densities of larval fishes observed in net samples collected during the night were significantly larger (0.001 level t-test) than the densities in the corresponding day collections. Mean densities of larval fishes in surface samples, bottom samples, and all samples combined were 9.0, 14.1 and 13.1 times larger, respectively, at night than the corresponding day values. Of the eleven species collected, gizzard shad, emerald shiners and white bass constituted 96% of the mean larval density in both the day and night samples and were significantly (0.05 level) more abundant in the night samples. In fact, the mean density of gizzard shad from all surface samples collected at night on June 25 ( $124.2/100m^3$ ) was 207 times larger than the corresponding day value ( $0.6/100m^3$ ). No significant (0.05 level) day/night differences were observed for carp, freshwater drum, rainbow smelt, spottail shiner, troutperch, walleye, or yellow perch, possibly due to their low densities in the samples.

10:00

THE FISH COMMUNITY OF THE GREAT MIAMI RIVER AS AFFECTED BY WATER QUALITY IN THE DAYTON, OHIO METROPOLITAN AREA. Chris O. Yoder and James R. Germon. Zoology Dept., DePauw Univ., Greencastle, Indiana 46135.

Seven indices of fish community diversity, abundance, and well-being and shifts in species composition were used to evaluate general water quality conditions in a 50 km section of the Great Miami River and lower Stillwater and Mad Rivers. Twenty-one zones were electrofished sequentially downstream four times each during June-September 1976 under below average flow conditions. A total of 2545 individual fish representing 40 species were collected. Distinct trends in the community indices from above to below the Dayton metropolitan area were evident and observed differences attributed to marked variations in water quality. The largest and most diverse assemblages of fishes were observed in the lower Stillwater R. and in the Great Miami R. above Dayton. The segment of the Great Miami R. influenced by the greatest concentration of point source wastewater discharges contained the fewest fish, lowest diversity, and lowest well-being index ( $I_{WB}$ ), as well as marked shifts in species composition, as compared to upstream segments. Some recovery may have occurred in the lower study area as evidenced by modest increases in the community indices. However, species composition remained relatively unchanged. The reduced fish community below the Dayton metropolitan area was attributed to point source discharges high in BOD, suspended solids, oil and grease, chlorine, and temperature. Dissolved oxygen concentrations during June-September 1976 below Dayton fluctuated widely and were frequently below levels compatible with a diverse and healthy fish fauna.

- 10:15** POPULATION DYNAMICS AND ECOLOGY OF THE NORTHERN STARHEAD TOPMINNOW  
FUNDULUS NOTTI DISPAR, IN DEWART LAKE, INDIANA.  
 Robert Haubrich Dept. Biology, Denison Univ., Granville, Ohio 43023

A 100 square meter unit of swamp was found to contain 6-8 young of the previous year which emerge in late March. They ripen during April and start laying eggs in May. The first young are visible by the end of May. The fertile period of both sexes lasts until early August. The gonads are largely involuted by September. The population by October reaches a peak of 70-80 viable young and 4-6 adults per 100 square meters. The fish are not visible from late November until March. No adult was seen to live through the second winter. Stomach analyses yielded insect larvae/adults, mites, snails and algal pieces. They also ingested mosquito larvae, hydra, annelids and flatworms. Cannibalism was not observed but is suspected. The fish during summer spent their time almost exclusively in a warm surface layer of water with average daily maximum-minimum temperatures of 89° and 77° F respectively. The species is becoming rare in some parts of its range (depleted in Michigan and Missouri and rare in Wisconsin).

- 10:25** PHYLOGENETIC AND PHENETIC RELATIONSHIPS IN ALGANSEA (CYPRINIDAE). Richard J. Jensen and Clyde D. Barbour. Department of Biological Sciences, Wright State University, Dayton, OH 45435.

Systematic studies may be characterized broadly as phylogenetic or phenetic. The two are not mutually exclusive but often result in different patterns of taxonomic relationships. One of us (C.D.B.) recently completed a monograph of the genus Algansea including a modified Hennigian phylogeny. The present study is a comparison of this phylogeny with phylogenies erected by numerical techniques, e.g., Wagner Trees and Compatibility Trees (after Estabrook), and with phenetic interpretations resulting from cluster analysis and ordination. The results are interesting in that Estabrook's compatibility analysis produces two equally probable phylogenies, one corresponding to the most parsimonious Wagner Tree and the other corresponding to both the phenetic analyses and the modified Hennigian phylogeny. The various interpretations are discussed and reasons given for concluding that the modified Hennigian phylogeny is the best estimate of evolutionary relationship in Algansea.

- 10:45** BIOTIC RESOURCES OF THE GREAT LAKES COASTAL WETLANDS Suzanne M. Hartley, John H. Marshall, Ohio State University, Columbus, Ohio 43210

The Ohio State University Center for Lake Erie Area Research (CLEAR) and the Indiana School of Public and Environmental Affairs (SPEA) are in the process of compiling a comprehensive inventory of completed and on-going research dealing with coastal wetlands along the United States' shore of the Great Lakes. This paper presents a summary of the findings in terms of past and current research in the areas of vegetation, fisheries, mammals and invertebrates. The paper describes the location of the coastal wetlands within the geographical area of study. The study area includes the coastal wetlands of the five U.S. Great Lakes and their connecting channels (1/2 acre or more in size, and lying within 1000 feet of the shoreline), river mouth estuaries, and marshes situated on American islands. Wetland areas were located using a set of USGS topographical maps for the Great Lakes and aerial reconnaissance for verification. The entire project is being done under the auspices of the Fish and Wildlife Service of the United States Department of the Interior, and the final publication will be used in permit review, impact statement review, and in the planning of baseline research and data gap projects.

## ZOOLOGY

11:00

PRELIMINARY STUDY OF THE EFFECTS OF BACILLUS THURINGIENSIS UPON THE HEMOCYTES OF THE FIFTH INSTAR EUROPEAN CORN BORER, OSTRINIA NUBILALIS HUBNER (LEPIDOPTERA: PYRALIDAE)

Spencer E. Reames 235 W. Ottawa Richwood, Ohio 43344

Fifth instar European corn borers were treated with per os dosages of saline suspensions of sporulated bacteria, Bacillus megaterium or Bacillus thuringiensis var. thuringiensis, or saline. Hemolymph samples were taken at given time intervals after treatment and then smeared onto a clean slide and stained with Giemsa. The cells were observed under oil immersion. There appears to be no change in the differential count in terms of cell types (prohemocytes, plasmatocytes, granular hemocytes, spherule cells, and oenocytoids), but there does appear to be an increase in the number of degenerating cells. In view of this data, further studies are warranted.

11:15

PLAN FOR BIOLOGICAL CONTROL OF THE FLY, Cochliomyia macellaria, IN THE GALAPAGOS. Karl Schurr, Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403.

Ships carry the secondary screw worm, Cochliomyia macellaria, among the Galapagos Islands. The objective of this study was to find a way to eliminate this pest insect. Its distribution is limited to the coastal edges where there are sources of food for the maggots. The adults attack the eyes of the fur seals Arctocephalus galapagensis and the sea lions, Zalophus californianus wolfebaeki. Adult fur seals and sea lions enter the ocean each day to feed and are apparently protected by the osmotic effects of sea water. The pups, however, remain on the beaches and are blinded by the transmission of an optic disease. Since the fly is limited in distribution and is dependent on filth or carcasses for reproduction, a standard sanitation program can prevent large populations from developing. Maggots of C. macellaria leave the larval food source and crawl down into the soil to pupate. Bait placed on racks over shallow marine waters attracts egg deposition by adult flies. Mature maggots crawl through the rack floor and fall into the sea water, where they die. This method combined with quarantine measures, has the potential for eradication of the pest.

A SURVEY FOR HOUSE DUST MITES IN COLUMBUS, OHIO

11:25

Midori Yoshikawa and Peggy H. Bennett  
Acarology Laboratory, The Ohio State University  
484 West 12th Avenue, Columbus, Ohio 43210

Thirteen houses in the Columbus area were examined in August and September 1977. In each house, dust was collected from the mattress, the mattress edge, the pillow, and the blanket. The most common mites found in these sites were members of the genus Dermatophagoides (Pyroglyphidae); the mean number per collection was 46.6 mites. Other mites, such as Acaridae, Tarsonemidae, and Cheyletidae, were also found but these occurred in much smaller numbers.

11:40 A.M. BUSINESS MEETING

11:40 A.M. Business Meeting  
 AFTERNOON SESSION, 1:30 P.M.  
 Bio Sci 103  
 Membership Chairman, TIMOTHY WOOD, Presiding

- 1:30 THE EFFECT OF ECDYSTERONE ON CHITIN BIOSYNTHESIS IN CRAYFISH EPIDERMIS.  
 Paul W. Armstrong and J. Ross Stevenson. Department of Biological Sciences, Kent State University, Kent, Ohio 44222.

The effect of ecdysterone at various stages of the molt cycle on N-Acetyl-1-<sup>14</sup>C-Glucosamine incorporation into Orconectes obscurus (Hagen) cuticle was studied. A significant effect on incorporation was observed after 24 hours of ecdysterone incubation.

The titers of physiological ecdysone were measured using O. sanborni (Faxon) at various molt stages.

The effect on stage C<sub>3-4</sub> O. obscurus (Hagen) after 24 hours of ecdysterone incubation was studied using electron microscopy. The injected crayfish showed an increase in the amount of clear vesicles formed when compared with controls but, no membrane blebbing (as seen in insects; Sedlak and Gilbert, 1975 and Locke, 1976) was observed.

- 1:45 LOCOMOTOR BEHAVIOR OF THE GALAPAGOS GIANT TORTOISE, GEOCHOLONE ELEPHANTOPUS.  
 Warren F. Walker, Jr. Department of Biology, Oberlin College, Oberlin, Ohio 44074

Cinephotographs and visual observations were made of mature Galapagos tortoises under natural conditions in large outdoor pens at the Estacion Charles Darwin on Santa Cruz Island, Galapagos in January 1977. When unaware of the observer both domed and saddleback type individuals traveled very slowly at rates of about 0.05 ms<sup>-1</sup> using primarily a lateral sequence, single footed gait. Awareness of the observer did not materially affect the rate of travel of the domed type, but the saddleback type was clearly disturbed and attempted to "run" away, increasing its rate of travel to 1.00 ms<sup>-1</sup> and using primarily a lateral sequence, diagonal couplet walk.

- 1:55 THE OCCURRENCE OF POSTHARMOSTOMUM HELICIS IN ANGUISPIRA KOCHI STRONTIANA  
 Benjamin N. Tuggle, Dept. of Zoology, The Ohio State University, 1735 Neil Ave. Columbus, OH 43210

The metacercarial stages of Postharmostomum helcis were recovered from the pulmonate snail, Anguispira kochi strontiana, from Green Island, Lake Erie. Snails were collected from four different areas on the island. The mean numbers of metacercaria found in the snails from each area are compared along with specific heights, diameters, and weights of the snails. In all zones combined the incidence of infection was 68.2%. Frequency of infection curves for snails with specific heights, diameters, and weights show a negative binomial distribution for the population examined. Snails with a height of 18 to 22mm, a diameter of 21 to 25mm, and a weight of 2.5 to 5.0g show the greatest frequency of infection in all zones combined. The mean intensities of infection for snails with specific heights, diameters, and weights do not correlate with the frequency of infection. The highest mean intensities were observed in those zones with the highest incidences of infection.

## ZOOLOGY

- 2:05** SEASONAL OCCURRENCE, HOST SPECIFICITY, AND PATHOGENICITY OF GRACILISENTIS GRACILISENTIS (ACANTHOCEPHALA: NEOECHINORHYNCHIDAE) IN DOROSOMA CEPEDIANUM. Reid Jilek, The Ohio State University, Columbus, Ohio, 43210.

The pyloric caeca and small intestine of 1,117 gizzard shad, Dorosoma cepedianum, collected from Crab Orchard Lake, Williamson County, Illinois, between March, 1976 and February, 1977, were examined for the presence of Gracilisentis gracilisentis. Infection is initiated in mid-May with immature adults occurring between September and November. This period coincides with the seasonal mortality of the host which occurs between the months of October and April. Histopathological examinations revealed severe damage to the mucosa and submucosa at the site of penetration with subsequent separation of these two layers. It was concluded that G. gracilisentis infections may totally, or in part, contribute to the seasonal mortality of D. cepedianum. In addition to D. cepedianum, 5 species of fish which serve as predators on the gizzard shad were also examined for the presence of G. gracilisentis. Indications of viability of G. gracilisentis were evidenced exclusively in D. cepedianum, therefore suggesting a high degree of host specificity.

- 2:15** MEIOFAUNA FROM THE CAPE COD BAY, MASSACHUSETTS, BIOTIC CENSUS. K.C. Emberton, Jr., Dept. Zoology, Ohio University, Athens, Ohio 45701.

Members of the Marine Biological Laboratory, Woods Hole, conducted a grid sampling of the 1000 km<sup>2</sup> Cape Cod Bay during the years 1965-1969. The grid was like a checkerboard, with alternate black squares on each row being sampled; squares were 1.6 km (1.0 mi) on a side. From the center of each of the 96 squares sampled came the following information: 1) physical-chemical and sedimentary data, 2) macrofaunal data, using a 0.10 m<sup>2</sup> Smith-McIntyre grab, and 3) meiofaunal data, using two 3.35 cm diam cores from a separate grab haul. Additional data for 1) and 2) were taken from the corners of the squares as well. Meiofaunal cores were treated with 0.015% propylene phenoxetyl to narcotize the animals and then with 10% buffered formalin in seawater to fix them.

Depths ranged from 0 to 53 m, temperatures from -2.5 to +23.50C and sediments from clayey silts to coarse sands. The present analysis is restricted to the 84 of 182 samples, which represent sandy sediments. Meiofauna were extracted by multiple decantation and were tallied to major taxon using multiple Sedgwick-Rafter counts. State of preservation is variable but generally good, with several delicate forms (e.g. Turbellaria, Gastrotricha) well represented. Meiofaunal densities range from 150 to 13,400 per 10 sq cm surface, with 3/4 attributable to the Nematoda and Harpacticoida. Preliminary analysis indicates significant differences between taxa with respect to both sediment size and season of collection.

- 2:30** MEIOFAUNA-MACROFAUNA INTERACTIONS: 2. GASTROTRICHA TAXOCENE AFFECTED BY PROXIMITY TO ARENICOLA BURROWS. W.D. Hummon, Dept. Zool., Ohio Univ., Athens, Ohio 45701.

On April 16 1975 my regular series of 77 10-cm<sup>3</sup> sediment samples from a eutrophic beach at Irvine Bay, Scotland, was augmented to 133 by samples from the Arenicola marina zone. This raised the number of Gastrotricha enumerated and identified to species from 3,900 to 12,860, the gastrotrichs being the dominant meiofaunal taxon in this portion of the beach. The Arenicola-zone samples were arrayed in a matrix of five beach elevations, four depths and four locations relative to Arenicola burrows: between burrows (inter-burrow, represented by normal transect samples), head-shaft, tail-shaft and between head- and tail-shaft (intra-burrow). Because of the large number of animals to be analysed while alive and healthy, replicates were not taken. Ten species of gastrotrichs were tallied, mostly Turbanella hyalina, followed by Paraturbanella dohrni, Cephalodasys turbanelloides and Neodasys chaetonoideus. A 3-way ANOVA, based on log(x+1) transformed values, indicates significant differences for total gastrotrichs for each of the four species between stations and between depths, and for all but P. dohrni between locations relative to Arenicola burrows. Head- and tail-shaft locations showed enhanced numbers of total gastrotrichs, T. hyalina and C. turbanelloides relative to those found in inter- or intra-burrow location, but the opposite was the case for N. chaetonoideus. Results indicate that biotic rewording by Arenicola, even in a well-aerated beach such as the one studied above, can enhance the meiofaunal content of the sand and may provide the lug-worm with a greater deposit-feeding source of nutrients than has been previously supposed. Supported by a NATO Postdoctoral Fellowship.

**2:45** FINE STRUCTURAL CHANGES IN LEPIDODERMELLA SQUAMMATA (GASTROTRICHA:CHAETONOTIDA) DURING MATURATION AND AGING. M.R.Hummon, Dept.Zoology, Ohio Univ.,Athens, Ohio 45701.

Lepidodermella squammata is a freshwater metazoan, whose egg undergoes immediate direct development and hatching in about 24 hours. A 75  $\mu$ m long juvenile reaches 150  $\mu$ m and reproductive maturity several days after hatching under laboratory conditions. It is considered to be an obligate parthenogen, and an individual raised from an egg in isolation will typically lay four eggs over the period from day 5 to day 10. Death in culture occurs 15 to 28 days after hatching, and the survivorship curve is characteristic of a population whose members undergo true aging. Thus L. squammata is suitable for the study of maturational and aging changes by virtue of its small size, short generation time, and relatively long period of post-reproductive activity. Occasionally, so-called winter eggs are laid: these do not undergo immediate development, are always the final egg laid by an individual, and are able to survive drying. There are no reports of testicular development in this species.

Animals were grown in individual culture in filtered lake water, with bakers yeast added to support a variety of bacteria and protozoa. Individuals of known age were prepared for EM and thin sections were examined from animals of the following post-hatch ages: 1 hour, pre-reproductive (36 hours), mid-reproductive (6-7 days), post-reproductive (10 days) and aged (20 days). Preliminary analysis indicates differences with age in oocyte development, gut cell characteristics and inclusions, pharyngeal integrity, epidermal inclusions, and the possible presence of sperm heads in post-reproductive animals. No changes in protonephridial structures have been noted. Supported by a grant from the U.S. Dept. Int.-Ohio Water Resources Center.

**3:00** A STUDY OF THE TARDIGRADA FROM SELECTED SOUTHEASTERN OHIO STREAMS. R. H. Wainberg, Dept. Zoology, Ohio University, Athens, Ohio 45701.

The "water bears" of the phylum Tardigrada are benthic hygrophilic metazoans which rarely exceed 1 mm in total body length. They are usually abundant within lentic, lotic and marine sand grain pores, or in water films occurring over moss-lichen substrates after rainfalls. A preliminary survey of acid-mine polluted, unpolluted and reclaimed southeastern Ohio streams has indicated that this meiofaunal group is greatly reduced in numbers under pollution conditions. At only two polluted sites have tardigrades been found - one poorly preserved Macrobiotus macronyx Dujardin specimen bearing epizootic protozoans from Sandy Run and a Hypsibius sp. from Raccoon Creek. The unpolluted sites of Strouds Run, Oppossum Creek and Margaret Creek have yielded M. macronyx, Macrobiotus hastatus Murray, Hypsibius augusti (Murray) and Hypsibius sp. Two Hypsibius articus (Murray) Marcus specimens have been found at the reclaimed site of Tick Ridge. A study of the growth cycle of H. augusti from Strouds Run has shown that probably 7 instar stages occur, with ecdysis following each of these stages. The proposed instar lengths are substantiated by the lengths of the shed cuticles which have been found, although there appears to be some discrepancy based on whether the shed cuticle contains eggs or not. The ecological parameters of season, elevation above the water-line, sediment depth and time since the last precipitation appear not only to affect the numbers of H. augusti per cc of sediment but also the body length.

Supported by a grant from U.S. Dept. Int.-Ohio Water Resources Center.

**3:15** DYNAMICS OF AN INTERTIDAL POPULATION OF THE INFAUNAL BIVALVE, MACOMA SECTA. J.G. Rae, Dept. Zoology, Ohio University, Athens, Ohio 45701.

An intertidal population of Macoma secta was studied for a period of 13 months in Tomales Bay, California. The population demonstrated temporal stability in density and size of individuals for a given tidal height. However, both density and size of individuals differed significantly with tidal height. A measure of seasonal population variability, the Population-Time Mean Square, was found to have zero correlation with tidal height, indicating that net environmental stress was similar for individuals at each tidal height. In the midtide zone the clams were smaller, but more dense; in the upper tidal zone they were larger but less dense. The greater spat mortality in the upper tidal zone was compensated for in adults by a greater capacity to dig deeper in the sediment, avoiding stressful conditions. Standing biomass ranged from a winter low of 54.2 to a summer high of 89.9 dry weight gms/m<sup>2</sup>. Fecundity estimates indicate M. secta adds 43 % of its winter weight in gametes, which is low for bivalves. Spat-fall, detected in January, was light (24/m<sup>2</sup>) and was successful only in two distinct "nursery areas". There is strong evidence for the density dependent growth of individuals in this population, a factor believed to be important in the stability of the population.

## ZOOLOGY

3:30

WINTER GROWTH OF THE MACROBENTHIC FAUNA IN ACTON LAKE, HUESTON WOODS STATE PARK, OHIO. Paul M. Daniel, Miami University, Oxford, Ohio 45056.

Benthic dynamics have been well studied in a variety of freshwater impoundments over a considerable period of time. Changes in standing crop over the spring and summer periods have been well documented but winter data are not as common. Grab samples from 1964 to 1976 at six meter and nine meter depths have been made in the December to March period. Chaoborids, chironomids and annelids make up the fauna considered. The more recent samples show an increase in the proportion of the fauna made up of annelids, largely *Limnodrilus hoffmeisteri*. Numerically chaoborids, chironomids and oligochaets varied in relative abundance at different winter times at different stations. Dry weights of both annelids and chironomids were consistently heavier than those of the standing crop of chaoborids. Maximum standing crop biomass is reached in the late winter period in Acton Lake.

3:40

DEER DIETS AS DETERMINED BY MICROSCOPIC ANALYSIS. Jack Rose and John D. Harder  
The Ohio State University, Dept. of Zoology, 1735 Neil Ave., Columbus, Ohio 43210

The seasonal feeding habits of the white tailed deer (*Odocoileus virginianus*) herd on the National Aeronautics and Space Administration's Plum Brook Station, near Sandusky, Ohio were determined by microscopic analysis. At the time of this study, 2,499 ( $\pm 94$ ) deer inhabited the area, a density of 298 per square mile. In spite of this record high density, overall health of the herd has remained high. It is our hypothesis that year around grazing on the extensive grassy areas of the station maintained the herd in a high plane of nutrition. Ten animals were collected monthly by shooting with rifled slugs, and a one liter sample of rumen contents removed. Subsequently, each sample was oven dried and ground over a 1 mm. sieve. A subsample was cleared and mounted on five microscope slides. Identifications were made using plant epidermal characteristics. Twenty fields of vision were analyzed for each slide and the sample composition expressed on a percentage basis. Despite 60 percent of the station being covered by deciduous trees and shrubs, at no time during the year was woody browse found in large amounts in the rumen contents. This study indicated that the herd grazed extensively year around. Data will also be presented comparing the feeding habits of the herd during the mild winter of 1976 and the severe winter of 1977.

3:55

TRIVERS' RECIPROCAL ALTRUISM: AN INFEASIBLE EXPLANATION OF WARNING CALL BEHAVIOR OF SMALL PASSERINES Robert Fisher PO Box 1274 Kenyon College Gambier, Ohio 43022

Robert Trivers' (1971) theory of reciprocal altruism proposes that altruistic behavior is reciprocally directed among individuals and is applied to the warning calls of small Passerines. Trivers' application to warning calls is critically evaluated here to illustrate Trivers' misconceptions. Trivers theorizes that a specific warning call bird within a group of non-calling birds suffers greater predation since the caller is located by a predator more frequently. However Trivers states that the warning caller is at a selective advantage to a group of non-callers since the caller suffers lesser predation than the non-callers. A model of Trivers' theory is introduced to facilitate discussion of his faults. The model is composed of two groups. Group A is defined by proximity to a caller. It includes non-callers a and callers a'. Group B includes non-callers b who are out of hearing range of callers. Natural selection favors individuals with a greater frequency of escape of predation (eP). Individuals a' have a negative eP relative to a and a positive eP relative to b but individuals a' are always selected against since they never coexist with b. Individuals b become a in the presence of a'. Therefore the callers will die out due to greater predation, thus Trivers' model is inviable. Furthermore, Trivers' model fails to satisfy his own criteria for reciprocal altruism. Individuals a are not reciprocally altruistic to a', a necessity of Trivers' model. Reciprocal altruism is only possible in organisms having higher levels of intelligence (eg. primates).



- 4:10 THE SEASONAL MOVEMENT OF GOLDEN AND BLACK REDHORSES (*MOXOSTOMA ERYTHRURUM* AND *M. DUQUESNEI*) IN CLEAR CREEK, FAIRFIELD AND HOCKING COUNTIES, OHIO  
Charles G. Smith Biology Dept., Lake Erie College, Painesville, OH 44077

The seasonal movement of golden and black redhorses was studied in a 12.4 km section of Clear Creek in Fairfield and Hocking Counties, Ohio. During October and November 1974 and February, April, and May 1975, 1231 golden (150-340 mm) and 1061 black redhorses (180-390 mm) age three and older were captured from 53 sites (pools) by electrofishing. In February, April, May, and October 1975, 494 golden and 460 black redhorses were recaptured, with 58.7 percent of the golden and 52.8 percent of the black redhorses exhibiting no inter-site movement. The home ranges (i.e. the average distances moved as measured from the original capture site) were .425 km for golden and .522 km for black redhorses. No significant differences were found between average distances moved in the spring as compared to the fall, nor could any relationship between fish length and distance traveled be established. The recapture data demonstrated that the golden and black redhorses did not exhibit any mass seasonal movement patterns and the majority were believed to be permanent, sedentary residents of Clear Creek. This conclusion is contrary to much of the general information available on golden and black redhorses (which indicates that these species are highly migratory), therefore suggesting the existence of major behavioral differences between populations.

- 4:30 A STUDY OF THE ABILITY OF ADENOSINE 3',5'- MONOPHOSPHATE TO INDUCE REGENERATION IN DENERVATED, AMPUTATED FORELIMBS OF ADULT NEWTS. James R. Dasch, Kenyon College  
Gambier, Ohio 43022

A study by J.E. Foret indicated that injection of an Adenosine 3',5'- Monophosphate derivative, dibutyryl cAMP, was capable of significantly stimulating mitotic activity in denervated, amputated newt forelimbs. By following his essential format, we studied the effect of dibutyryl cAMP on the regenerative processes of the adult newt, *Notophthalmus viridescens*. Injections of  $10^{-7}$  Molar dibutyryl cAMP in a vehicle of HEPES buffered Ringers solution were administered daily for three weeks post-amputation beginning on the fourth day post-amputation. Bilateral denervations of the 3,4, and 5 spinal nerves were performed at the time of the amputations. Sections were prepared from five experimental groups which had been allowed to progress from 2 to 6 weeks post-amputation. Mitotic figures were found in those limbs which had received the dibutyryl cAMP. However the presence of a dermal layer between the epidermis and subjacent tissues showed that regeneration was not going to occur in these limbs. Significant results from a second study using a much more concentrated dose of dibutyryl cAMP are also discussed. Although Foret's observation of enhanced mitotic activity is demonstrated; the mitotic activity is not necessarily a typical step of that sequence of regenerational processes under neurotrophic control.

- 4:45 PIGMENTATION IN THE WHITE BLOOD ( $w^{bl}$ ) MUTANT OF *Drosophila melanogaster*.  
Thomas C. Gregg Miami Univ. Oxford, Oh 45056.

The  $w^{bl}$  mutant in *D. melanogaster* is heavily pigmented but contains no drosopterin pteridines. Blocking the brown pathway results in an eye about one half as heavily pigmented. Thus in  $w^{bl}$  either there is a red pigment produced without drosopterins or a novel pigment such as a melanin. Attempts to rule out a tyrosine based pigment have been inconclusive because of the wide variation in the tyrosine incorporated by different larvae. To circumvent this difficulty larvae were grown on media containing label tryptophan or tyrosine. Heads of the adults were extracted with acidified ethanol, which extracts red pigment but not brown, and then acidified methanol, which extracts brown pigment leaving the eyes colorless. Thus it was possible to determine for each fly what proportion of the label had been extracted with each pigment fraction and what proportion remained in the head. Using tryptophan (precursor of brown pigment) with wild type (red and brown pigment), vermilion (no brown pigment), white (no pigment), and  $w^{bl}$ , it was possible to show that the proportion of label extracted with the brown pigment fraction was significantly higher in wild type and  $w^{bl}$  than in vermilion and white. This serves as a control for if it is not possible to show concentration differences when pigment differences are known to exist any negative result with tyrosine would be unconvincing. When the same genotypes were compared using tyrosine there were no differences, suggesting that there is no tyrosine based pigment in  $w^{bl}$  and that red pigment is formed without drosopterins.

## ZOOLOGY - PLANT SCIENCES

5:00

POSSIBLE SUPERFETATION OR SPONTANEOUS SUPERFETATION IN A FEMALE WHITE-TAILED DEER  
Bonnie L. Lamvermeyer, Biology Department, Case Western Reserve University,  
Cleveland, Ohio 44106  
George H. Matschke, U.S. Fish and Wildlife Service, Building 16, Denver Federal  
Center, Denver, Colorado 80225

We have observed a previously undescribed anomaly in white-tailed deer (*Odocoileus virginianus*). Two live fetuses, one male and one female, of different sizes were excised from the uterus of a 3.75 year old pregnant female of unknown breeding history.

The female was the larger of the two fetuses, weighing 171.5 gms and measuring 18.6 cm, crown-rump. The male weighed 124.0 gms and measured 13.9 cm, crown-rump. The female and male fetal ages were computed to be 96 and 82 days, respectively.

Ovulation occurred only in the right ovary as three corpora lutea of approximately the same size were present. However, each uterine horn contained a fetus.

Assuming that under identical conditions the growth gains are approximately the same in all individuals of a species, the difference of 14 days in the computed fetal ages suggests different implantation dates for the two fetuses.

Superfotation and spontaneous superfotation are two mechanisms capable of producing the age differences observed. Neither of these anomalies have been previously reported for white-tailed deer in the United States.

## B. SECTION OF PLANT SCIENCES

Section B will meet in three concurrent sessions.

FIRST MORNING SESSION, SATURDAY, APRIL 22, 9:00 A.M.

Oelman 103

Vice President, RONALD L. STUCKEY, Presiding

9:00

CONTRIBUTIONS OF REV. LEWIS DAVID VON SCHWEINITZ TO NORTH AMERICAN PHANEROGAMIC BOTANY. Ronald L. Stuckey, Department of Botany, 1735 Neil Avenue, Columbus, Ohio 43210.

Rev. L. D. von Schweinitz (1780-1834), a clergyman and administrator of the Moravian Church's affairs in North America, has been considered the "Father of North American Mycology." His contributions as a phanerogamic botanist in the 1820's, however, have been little noticed. His carefully researched papers on the difficult genera *Viola* (1822) and *Carex* (1824, 1825) were among the first monographic treatments written on American flowering plants and published in the United States. In the latter work, he first introduced the dichotomous key. His "Synopsis Plantarum Americanarum," a 357-page manuscript describing the known phanerogamic plants of North America, was his major floristic work, and had it been published, it would have provided in its day a standard reference for North American flowering plants. A major achievement was his extensive herbarium (now at PH) of some 23,000 specimens of vascular plants acquired by his own collecting, exchange with some 108 contributors, and purchase of the herbarium of William Baldwin. Because of the methods Schweinitz used in developing and maintaining his herbarium, it has been difficult for many twentieth century botanists to determine which specimens actually represent type material. My studies in 1973 and 1977 have revealed 188 specimens that represent possible types of phanerogams described from eastern North America by Schweinitz or his contemporaries, many of whom he influenced early in their botanical pursuits. A catalog and commentary on these types are now ready for publication.

9:15

A FLORISTIC ANALYSIS OF THE OLD WOMAN CREEK ESTUARY AND CONTIGUOUS UPLANDS  
ERIE COUNTY, OHIO John H. Marshall, Center for Lake Erie Area Research (CLEAR),  
484 W. 12th Ave., Columbus, Ohio 43210

Old Woman Creek, a drowned stream mouth covering 0.3 Km<sup>2</sup>, on the south shore of Lake Erie, lies one mile east of Huron. The vascular plant-flora of the Old Woman Creek Estuary and contiguous non-agricultural uplands is analyzed with respect to geographical relationships, species diversity, flowering phenology and the degree to which environmental alteration has influenced species composition. Species of widespread distribution are most prevalent, while species of restricted distributions are less abundant throughout the study area. Non-indigenous species comprise 26 percent of the flora, indicating environmental disturbances resulting from the activity of man and the effects of Lake Erie. The low diversity of submersed aquatic plants is thought to result primarily from high turbidity, whereas the low diversity of wetland species results from a limited availability of suitable habitat. A prairie flora, perhaps established following fire, is in the old field northwest of the railroad trestle. The occurrence of hardwood saplings in this area indicates that this prairie element is only temporary.

**9:30** VASCULAR-PLANT FLORA OF EARTHEN DIKES BORDERING WESTERN LAKE ERIE IN OHIO. Robert J. Bartolotta, Department of Botany, 1735 Neil Avenue, The Ohio State University, Columbus, Ohio 43210.

The species composition and the successional stages of the vascular plant communities was floristically analyzed for 21 earthen dikes of known vegetational age from Magee Marsh (Lucas and Ottawa Counties), Moxley's Marsh (Erie County), and Winous Point Shooting Club (Ottawa County property only). First year dikes which were constructed from marsh sediments were dominated by Polygonum lapathifolium which germinated directly from seeds in the sediments. Second to fifth year dikes were dominated by Abutilon theophrasti, Asclepias incarnata, Brassica kaber, Cirsium arvense, Convolvulus sepium, Impatiens capensis, and Melilotus spp. which had been seeded from surrounding terrestrial and wetland sources subsequent to dike construction. Dikes of ten years or older age were dominated by Cornus drummondii, Populus deltoides, and Salix spp. Of the 177 species cataloged, terrestrial species exceeded wetland species by 3 to 2. Non-indigenous species comprised 34% of the flora. Species generally associated with man-disturbed habitats were most frequent on the upper, drier substrates of the dikes. Species generally associated with naturally-disturbed habitats were most frequent on the lower, moist substrates of the dikes. Non-indigenous species of man-disturbed habitats constituted 44% of the terrestrial flora. Indigenous species of naturally-disturbed habitats totalled 74% of the wetland flora.

**9:45** DISTRIBUTION PATTERNS IN OHIO SCROPHULARIACEAE. Tom S. Cooperrider, Department of Biological Sciences, Kent State University, Kent, Ohio 44242.

A recently completed survey of Ohio herbaria, augmented by field study, reveals 73 species of the Scrophulariaceae in the Ohio flora. Of these, 42 are native and 31 are alien; of the aliens, 13 are naturalized, while 18 are adventive or imperfectly naturalized. Several species show distribution patterns of interest. Gratiola viscidula var. shortii, Short's Hedge Hyssop, is endemic to southernmost Ohio, and nearby sites in West Virginia and Kentucky. Mimulus ringens, Monkey-flower, the most widespread native species, and Verbascum blattaria, Moth Mullein, and V. thapsus, Common Mullein, the most widespread aliens, are known from nearly all 88 counties. Penstemon canescens, Gray Beard-tongue, chiefly of the southern Appalachians, is found only in southernmost Lawrence County. Scrophularia lanceolata, Lance-leaved Figwort, is found primarily in NE Ohio, while S. marilandica, Maryland Figwort, is widespread in the state. Chaenorrhinum minus, Dwarf Snapdragon, found chiefly on railways, is widespread but now infrequent because of destruction by herbicides. Digitalis grandiflora, Yellow Foxglove, an imperfectly naturalized alien, has not previously been reported for Ohio. Veronica filiformis, Blue-eyed Speedwell, is invading lawns in NE Ohio; of the 12 county records, only two antedate 1950. The native Veronica catenata, Water Speedwell, is found only in the western half of the state. Aureolaria laevigata, a False Foxglove, is sharply limited to the unglaciated Allegheny Plateau of south-central Ohio. Buchnera americana, Bluehearts, is known from southern and northern counties.

**10:00** STUDIES OF MIXED-SPECIES POPULATIONS OF HUDSONIA ON CAPE COD, MASSACHUSETTS. Larry E. Morse, Gray Herbarium, Harvard University, now at New York Botanical Garden, Bronx, N.Y. 10458.

Hudsonia ericoides and Hudsonia tomentosa contact parapatrically at several localities along the Atlantic coast, and interspecific hybrid individuals are frequent in these special localities. The largest mixed-species Hudsonia populations are on Cape Cod, Massachusetts. Here the putative  $F_1$  hybrids are frequent in certain transitional habitats between pine-woods clearings and open dunes, and individual hybrid clones can be spectacular when in full flower. Yet, there is little evidence of further hybridization, or of gene flow or introgression into adjacent populations. Studies of phenology and pollination ecology showed flowering time to be a significant isolating mechanism, as the flowering seasons of the two species peak several days apart. Furthermore, most seed appears to originate by selfing, suggesting the conspicuous hybrids are due more to increased growth and persistence than to increased seed production. My interpretation of these populations supports the view that these taxa are best recognized as distinct species that hybridize interspecifically on rare occasion yet are continuing their own ways evolutionarily.

## PLANT SCIENCES

10:15

MORPHOLOGICAL VARIATION IN THE RECEPTACULAR BRACTS OF MONTANOA CERV. (COMPOSITAE: HELIANTHEAE) AND THEIR POSSIBLE ADAPTIVE SIGNIFICANCE. Vicki A. Funk, Dept. of Botany, The Ohio State University, Columbus, OH 43210.

The presence of bracts at the base of the florets (referred to as pales, receptacular bracts or chaff) is not unique to the genus Montanoa Cerv. (Compositae: Heliantheae). Indeed, most genera contained in the tribe Heliantheae have a chaffy receptacle. However, few have such well developed pales and none have the wide-ranging morphological variation that is found in Montanoa. Information gleaned from herbarium studies lead to several hypotheses concerning the adaptive significance of this variation. Observations made in the greenhouse and on recent field trips to Latin America have enabled the investigator to expand and alter these hypotheses and to make statements concerning protective and dispersal mechanisms of the pales. All species of Montanoa have greatly elaborated receptacular chaff that surrounds the achenes and greatly surpasses them in size. The pales are protective in nature, but they are also adapted for dispersal. The morphological adaptations fall into four categories. These categories are based on a variety of features including whether or not the pales are deciduous with the achenes or whether the entire head is deciduous, and on the presence or absence of such morphological features as hook-like projections, dense pubescence and reflexed tips. These categories are discussed and possible dispersal mechanisms are presented for each.

10:30

GENETIC VARIABILITY IN A POPULATION OF PITCHER PLANTS, SARRACENIA PURPUREA L. Kent E. Schwaegerle and Barbara A. Schaal, Department of Botany, The Ohio State University, Columbus, Ohio 43210.

A population of pitcher plants, Sarracenia purpurea L., on Cranberry Island, Buckeye Lake, Licking County, Ohio was established by the introduction of a single specimen in 1912. The population was analyzed for genetic variability by using allozyme electrophoresis. Eight enzyme systems were routinely resolved and no polymorphic loci were found. This low level of genetic variation is ascribed to founder effect.

10:45

THE LIFE HISTORY OF POTAMOGETON CRISPUS WITH EMPHASIS ON ITS REPRODUCTIVE BIOLOGY. John R. Wehrmeister, Department of Botany, 1735 Neil Avenue, The Ohio State University, Columbus, Ohio 43210.

Potamogeton crispus L. (Potamogetonaceae) is a non-indigenous perennial submersed rooted aquatic vascular plant. Field and herbarium studies indicate that the plant exists in its dormant state, maintained by vegetative "dormant apices" from mid- through late-summer. Formation of these dormant structures at stem apices occurs in late spring. Germination is initiated in early fall. The vegetative plant exists in ponds in a photosynthetically active state under even relatively thick ice and snow cover, in light intensities of 120 foot candles or lower. The leaves of the winter form are flat, blue-green in color, and narrow in contrast to the undulate-margined, reddish-brown, wider leaves of the spring form. In early spring, flowering and fruiting occurs, in much greater abundance than suggested in the literature. Higher rates of germination of dormant apices and seasonally earlier onset of germination in these structures occur (1) at lower water depths and (2) when surrounding plants of different species are removed from the vicinity of ungerminated dormant apices. The environmental requirements which are the basis for these phenomena may include (1) the necessity for a cold treatment of dormant apices and (2) exposure to a minimum threshold light intensity, before germination can occur. Dormant apex production can be induced under constant temperature by varying photoperiod. Plants under culture conditions of 25°C at 16-hour daylengths initiate dormant apex production. Dormant apex production is not initiated even after eight weeks at 25°C, with eight-hour daylengths.

11:00

THE POLLINATION ECOLOGY AND ENDEMIC ADAPTATION OF THE FURBISH LOUSEWORT (PEDICULARIS FURBISHIAE S. WATS.). Lazarus Walter Macior, Department of Biology, The University of Akron, Akron, Ohio 44325.

The endemic Pedicularis furbishiae consists of about 600 plants confined to the St. John River Valley between Maine and New Brunswick. It was found to prefer calcareous, well-drained, sandy loam of river terraces subject to erosion by high water from below and from landslides above. Soil samples from habitats varied widely in pH (5.2-7.0), phosphorus (15-100 ppm), calcium (<100->2800ppm), aluminum, and organic matter. Consistently associated with Alnus crispa (Ait.) Pursh, Pedicularis had no root-parasitic relationships with it or any other plants. The greenish-yellow, personate, tubular, odorless, nectariferous flowers were neither self-pollinating nor self-compatible. They were obligately dependent for pollination on workers of Bombus vagans F. Smith, which foraged nototribically primarily for nectar. Insect proboscis length was identical with corolla tube length; other bumblebee species preferred nectariferous tubes corresponding to their respective proboscis lengths. The short proboscis of B. terricola consistently perforated corollas of Pedicularis. Since the pollination syndrome of P. furbishiae is unique and the species is isolated geographically from P. lanceolata and phenologically from P. canadensis, the only other species in eastern, temperate North America, it is probably derived from boreal or western taxa. Its extreme endemism is more likely caused by limited availability of suitable habitat than by limited numbers of suitable pollinators.

## SECOND MORNING SESSION, 9:00 A.M.

Oelman 119

Membership Chairman, IRWIN A. YOUNGER, Presiding

9:00

EFFECTS OF IAA AND 2,4-D ON THE TRANSLOCATION OF PHOTOSYNTHETICALLY FIXED  $^{14}\text{C}$  IN THE SUGARBEET T.R. Conti and D.R. Geiger, Dept. of Biology, University of Dayton, Dayton, OH 45469

The effects of IAA (Indole-3-acetic acid) and 2,4-D (2,4-dichlorophenoxyacetic acid) on the translocation of photosynthetically fixed  $^{14}\text{C}$  were studied in individual sugarbeet plants (Beta vulgaris L.). IAA applied to a photosynthesizing source leaf was found to promote the rate of accumulation of translocate in sink leaves. The effect began 20 to 30 minutes after application of the IAA and lasted 30 to 50 minutes. Applications of 2,4-D by the same method caused a regular, linear increase in the rate of accumulation of translocated material in the sink. This effect began 20 to 60 minutes after application of the 2,4-D and continued for at least 7 hours, the duration of the longest experiment. No significant change in the surface pH of the source leaf (indicative of proton secretion) was observed as a result of application of the 2,4-D. Neither was there observed any change in the rate of photosynthesis of the source leaf as a result of addition of either compound.

It is not clear whether IAA and 2,4-D promote export or whether they enhance distribution to the sink leaves in which accumulation was monitored. Experiments to clarify this point are being undertaken by measuring simultaneously the effects of IAA and 2,4-D on the rate of accumulation of labeled translocate in the sink and the rate of export of labeled material from the source leaf.

9:10

ADAPTATIONS IN THE GROWTH OF LENTIL ROOTS TO SUDDEN TURGOR SHIFTS. Konrad M. Kuzmanoff and Michael L. Evans, Department of Botany, The Ohio State University, Columbus, Ohio 43210.

Kinetic studies of the growth of lentil roots under low turgor indicate a remarkable adaptability of the system to high external solute concentrations. A series of mannitol concentrations, ranging from 0.1 - 0.5 M was employed for these studies.

These concentrations cause immediate inhibition of elongation and induce shrinkage. Resumption of growth occurs 5-15 minutes after application of mannitol, with the latent period being concentration dependent. At concentrations of mannitol  $\leq 0.3$  M, the new growth rate is greater than, or equal to the rate prior to the addition of osmoticum.

Theoretically, resumption of growth in the presence of a 0.3 M mannitol solution would require a major decrease in cell wall yield stress (at least 7 bars), or a major internal solute concentration increase (about 0.3 osmolar), or some combination of these parameters.

Experiments are underway to determine which mechanism mediates growth/turgor adaptation, and the extent to which these mechanisms mediate auxin and acid effects on root elongation.

## PLANT SCIENCES

### INFLUENCE OF COMPRESSION ON GROWTH RESPONSIVENESS OF EXCISED PEA STEM SEGMENTS

9:25

Grant M. Barkley and Marsha Forrest, Department of Biological Sciences  
Kent State University, 4314 Mahoning Avenue, N.W., Warren, Ohio 44483

The response of growing pea stem segments (*Pisum sativum* var. Alaska) to compression stress was investigated using a modified transducer 'fast-growth' measurement technique. A normal compression load of 10 or 20 grams was applied to a column of five segments, excised from the first internode of three-day-old etiolated seedlings.

The initial response to loading, in growing segments (5.4 microns/segment/minute), is a rapid decrease in segment length (1%), followed by a slower three minute decline to the establishment of a lowered growth rate (1.1 micron/segment/minute). Segment response to unloading is also initially rapid with an elastic increase in length, followed by a slow time dependent change back to the growth rate prior to loading.

Treatment, during compression, with agents capable of promoting rapid growth responses (auxins, hydrogen ions and carbon dioxide gas) exhibit no response. Results of unloading in the presence of these rapid growth promoters, indicate that some growth may be 'stored' during compression and subsequently released after unloading.

9:40

THE EFFECT OF AUXIN ON CALLUS INITIATION IN *PISUM SATIVUM* L. Richard F. Allison  
and John P. Mitchell, Botany Dept., Ohio University, Athens Ohio 45701

The influence of the auxin 2,4-D on tissue culture initiation in the garden pea, *Pisum sativum*, was tested. Embryo explants from 1 day old germinating peas consisting of the hypocotyl and the proximal end of the radicle were placed on B5 medium containing the following 2,4-D concentrations: 0.0, 0.005, 0.05, and 0.5 mg/l. Cultures were kept in the dark at 20°C. Those at 0.0 and 0.005 mg/l 2,4-D developed roots but no callus; those at 0.05 and 0.5 mg/l 2,4-D developed callus material. When cultures were transferred to a 16 hour photoperiod chlorophyll synthesis began at the hypocotyl end of the explant and this tissue developed rapidly and eventually covered the whole callus.

Explants comprising the terminal 3 mm of the plumule from 4 day old pea seedlings were placed on B5 medium containing the following 2,4-D concentrations: 0.0, 0.01, 0.1, 1.0, 5.0 and 10 mg/l. Cultures were maintained at 20°C in a 16 hour photoperiod. Cultures lacking 2,4-D developed roots and shoots but lacked callus development. Concentrations of 0.1 mg/l and greater inhibited morphogenetic development but enhanced chlorophyllous callus development with optimum callus production at 1.0 mg/l 2,4-D.

Experiments of this nature are continuing utilizing other auxins.

9:55

RAPID INDUCTION OF  $H^+$  SECRETION AND GROWTH BY  $\beta$ -NAPHTHALENEACETIC ACID IN COLEOPTILES OF AVENA AND ZEA. Mary Jo Vesper and Michael L. Evans. Department of Botany, The Ohio State University, Columbus, Ohio 43210.

Auxin and fusicoccin (FC) are known to cause an increase in the efflux of  $H^+$  from coleoptile segments from which the cuticles have been removed. Auxin and FC also induce rapid growth responses in coleoptile segments, and because of this these two agents have been used as tools in investigations of the link between  $H^+$  secretion and rapid growth responses. It is known that auxin and FC induce  $H^+$  secretion by different mechanisms as measured by sensitivity to various inhibitors. We have found that high concentrations (0.5 to 1 mM) of the weak auxin  $\beta$ -naphthaleneacetic acid ( $\beta$ -NAA) also induce rapid  $H^+$  secretion (in less than 1 min) and growth (in about 5 min) and that the action of  $\beta$ -NAA more closely resembles that of FC than that of the strong auxins. One mM  $\alpha$ -NAA (a strong auxin) causes no significant increase in growth rate and results in an increase rather than a decrease in the pH of the external medium. When 1mM  $\alpha$ -NAA and 1mM  $\beta$ -NAA are given simultaneously to *Zea* segments a rapid growth response results even though there is very little change in pH of the external medium. Concentrations of 0.1 to 1 mM  $\beta$ -NAA cause a larger increase in growth rate and in the rate of  $H^+$  secretion than optimal levels (10  $\mu$ M) of indoleacetic acid.

- 10:10** PATTERN OF rRNA AND POLY(A)-RNA SYNTHESIS DURING INDUCTION AND EARLY STAGES OF EMBRYOID FORMATION IN DAUCUS CAROTA. Champa Sengupta & V. Raghavan. Department of Botany, The Ohio State University, Columbus, Ohio 43210

The regulation of synthesis of different molecular species of RNA and poly(A) containing RNA was investigated during undifferentiated growth of carrot cells in a medium containing 2,4-D and during their transformation into embryoids in a medium lacking 2,4-D. As reported earlier, transfer of carrot cells to an auxin depleted medium is accompanied by higher rates of RNA synthesis during the early hours followed by rates which are lower than the rates in the undifferentiated cells growing in 2,4-D containing medium. The higher rates of RNA synthesis in the undifferentiated cells after the first few hours was accounted for by accelerated synthesis of rRNA and tRNA. Based on the effect of inhibitors of RNA synthesis like cordycepin and actinomycin D, it was established that transformation is dependent on continuous RNA synthesis. However, synthesis of rRNA at normal rates does not appear to be essential for the early stages of transformation but is obligatory for stages beyond the heart shaped stage. Using affinity chromatography on oligo (dT)-cellulose column, rate of synthesis of poly(A)-RNA in the embryogenic and nonembryogenic cells was measured at different times. Poly(A)-RNA is synthesized by both undifferentiated and embryogenic cells with mean mobility between 25S & 16S rRNA. However, the rate of poly(A)-RNA synthesis was greater in the embryogenic cells during the first 12 hours after which the rate equaled that of the undifferentiated cells. It is concluded that the pattern of RNA synthesis during transformation of undifferentiated carrot cells into embryoids is different from that seen during undifferentiated growth.

- 10:25** THE INFLUENCE OF GROWTH REGULATORS ON REGENERATION OF THE GAMETOPHYTE OF ANEMIA PHYLLOIDIS (L.) SW. Thomas L. Reynolds, Department of Botany, The Ohio State University, Columbus, Ohio 43210.

Aseptically grown mature gametophytes of the fern, Anemia phyllitidis, were surgically divided into fragments that either possessed or lacked a meristematic notch. The role of the apical meristem and its interaction with certain growth regulators, such as IAA, BA, GA, and ABA, were examined during the subsequent regeneration of non-meristematic tissue halves. Entire gametophytes were not initiated from isolated apical fragments. Physiologically active concentrations of IAA led to a rapid initiation of regeneration resulting in a commensurate increase in the final size of regenerates, whereas the auxin antagonist, TIBA, completely inhibited regeneration. Benzyladenine exerted its most striking effect by greatly increasing the number of outgrowths formed by treated explants. GA has no effect on overall growth or regeneration. Exogenous ABA dramatically reduced regeneration. This effect was even more pronounced with the simultaneous addition of IAA. The results seem to indicate the probable existence of endogenous hormonal equilibria, established by the apical meristem, that maintain the normal form of an intact gametophyte.

- 10:40** DNA SYNTHESIS AND CELL DIVISION DURING SPORE GERMINATION IN LYGODIUM JAPONICUM. Milton R. Rutter. Dept. of Botany, 1735 Neil Ave., The Ohio State University, Columbus, Ohio 43210.

This paper describes the ontogenetic sequence of cell divisions and associated DNA synthetic patterns observed in sectioned spores of Lygodium japonicum (Thunb.) Sw., collected at different stages of germination. Following exposure to a saturating dose of red light, the spore undergoes an asymmetric division to form a basal cell, which retains nearly all of the storage inclusions, and an apical cell which expands and protrudes from the ruptured sporoderm. Division of the apical cell results in formation of a protonemal cell and an intermediate cell. Subsequently, the latter cell divides to form the primary rhizoid and a wedge cell adjacent to the protonemal cell. Secondary rhizoids may arise from later divisions of either the basal cell or the wedge cell. In addition, the wedge cell appears to have the capacity to form a secondary prothallial filament. Histochemical localization of cell constituents indicates an increasing concentration of cytoplasmic RNA and protein in the presumptive protonemal region of the spore cell prior to division. Autoradiography of <sup>3</sup>H-thymidine incorporation has shown that synthesis of nuclear DNA precedes each cell division. Although strictly nuclear DNA synthesis occurs during early stages of germination, extranuclear DNA synthesis increases greatly following division of the spore cell. The results are discussed in relation to earlier studies on cell division patterns seen in whole mount preparations of germinating spores of different species of Lygodium.

## PLANT SCIENCES

- 10:55** AN INSTRUMENT TO INTEGRATE RADIANT ENERGY DOSAGE IN FIELD MEASUREMENTS OF PHOTOSYNTHESIS. Konrad M. Kuzmanoff and Robert S. Platt Jr., Department of Botany, The Ohio State University, Columbus, Ohio 43210.

Primary production is a fundamental process in almost all aquatic communities, and its measurement is important for monitoring changes induced by pollution. The useful measurement of primary production by comparison of carbon assimilation in dark and light bottles has been jeopardized by inadequate measurements of photosynthetically active radiation reaching the light bottles during the time of incubation *in situ*. Needed is an inexpensive instrument that will summarize irradiation (intensity x time) over the period of incubation (usually several hours) at each of several sampling stations. Bulk effect photoconductors, such as Clairex photosensitive resistors, are suitable as detectors for bands at 515, 550, 620, 690 and 735 nm. Their characteristics are reproducible, relatively insensitive to temperature, and they are rugged and cheap. If only one wavelength is to be monitored, there are arguments in favor of 690 nm. In the current prototype, the resistance of the Clairex cell, which is a simple function of the light intensity, controls the frequency of an oscillator. This signal is integrated by TTL circuitry and the total displayed digitally at the end of the required time period. The stability of the IC components makes feasible a high level of electronic precision, but the non-linear response and asymmetrical wavelength sensitivity of the Clairex cell presents calibration problems. The circuitry may be adapted to the measurement of a variety of flux integrals or dosages, such as pressures, fluid velocities, humidities, and concentrations of  $O_2$ ,  $CO_2$ ,  $H^+$ , etc.

- 11:10** HOMEOSTASIS OF A MIXED OAK ECOSYSTEM FOLLOWING CLEAR CUTTING Gareth E. Gilbert  
Department of Botany, The Ohio State University, 1736 Neil Avenue, Columbus,  
Ohio 43210.

The mixed oak ecosystem of Neotoma--a wooded valley of south-central Ohio--was clear cut in  $\approx 1910$ . This perturbation did not, however, destroy the deep structure of the system which, due to the homeostatic mechanism of stump sprouting, is returning rapidly to steady state. Beginning in 1954, the density of woody stems  $> 2.5$  cm dbh was measured triennially and the resultant data enabled the derivation of the following equation which equates density of stems per 0.1 ha with time since 1954:  $D(t) = 89.72 + 113.6e^{-0.7762t}$ . According to this equation, the mixed oak ecosystem of Neotoma will attain density steady state in  $\approx 2005$ , at which time the density of woody stems  $\geq 2.5$  cm dbh will approximate 900 stems/ha.

### THIRD MORNING SESSION, 9:30 A.M.

Oelman 132

ROBERT L. ROMANS, Presiding

- 9:15** THE PERIPHYTON AND GEOBOTANY OF AN ACID MINE OUTFALL IN SOUTHEASTERN OHIO.  
Arthur H. Blickle, Department of Botany, Ohio University, Athens, Ohio 45701

The outpouring of acid mine water from a slope mine tunnel provides an excellent chemical environment for many different kinds of organisms. This ionic nutrient-rich soup supports algae, bacteria, fungi, protozoa, insecta, worms, bryozoa, mosses and lichens and is far from being the so-called aquatic desert reported by earlier investigators. The influences of these organisms on one another and on the periphyton as a whole is considered.



9:30

IS "CALAMOSTACHYS BINNEYANA" REALLY TWO SEPARATE SPECIES?  
Charles W. Good. Ohio State University, Lima, Ohio 45804

Numerous specimens of a small cone contained within coal ball petrifications collected in eastern Kentucky are compared with similar cones collected from two localities in Lancashire, England.

The British specimens definitely belong to the long established species *Calamostachys binneyana*, corresponding to previous descriptions of *C. binneyana* in all respects. The Kentucky cones have been reported in several publications as also belonging to *C. binneyana*, and indeed do resemble the European species in many respects such as size, general morphology, and type of spore produced. However, the Kentucky cones consistently differ from European *C. binneyana* specimens by lacking solid parenchymatous pith. The pith of the Kentucky cone specimens may be enough to warrant a separate species designation for the Kentucky cones. Slight anatomical differences such as that discussed here illustrate the problems involved in assigning species or subspecies to fossil specimens.

9:45

STRUCTURALLY PRESERVED STERILE AND FERTILE ANKYROPTERIS FROM THE LOWER PENNSYLVANIAN OF EASTERN KENTUCKY. James E. Mickle. The Ohio State University, Dept. of Botany, 1735 Neil Ave., Columbus, Ohio 43210

Specimens referable to the coenopterid fern genera *Ankyropteris* and *Tedelea* were discovered in coal balls of Lower Pennsylvanian age collected from eastern Kentucky. Ankyropterid specimens were identified as *A. grayi* (Will.) Scott on the basis of stem and petiolar anatomy. All but one of the specimens has a nodal anatomy similar to the type specimen, i.e., the axillary branch and petiole depart from the stem as a unit, and then the petiole forms from this unit. One specimen, observed in oblique longitudinal section, shows nodal anatomy similar to that seen in the type specimen of *A. glabra*, i.e., the petiole trace departs from the stem, followed by axillary branch departure from the stem. Some of the specimens possess abundant uniseriate, multicellular hairs on the stem and petiole; in others, hairs are absent. One specimen of *A. grayi* is characterized by abundant tyloses in the stem, petiole, and roots. Several small penultimate pinnae were identified and the ontogeny of these is discussed. Pinnules bearing sporangia referable to the genus *Tedelea* are characterized by marginal, pyriform sporangia arising from a thin lamina. The annulus is composed of large tapered cells on the distal 1/3 to 1/2 of the sporangium. Spores of the *Raistrickia* type were found in some sporangia. Spores and sporangia were studied by SEM and transmitted light. This is the first reported occurrence of *A. grayi* in North American deposits.

10:00

PHLOEM IN THE LOWER PENNSYLVANIAN FERN ETAPTERIS. Edith L. Smoot. Botany Department, The Ohio State University, Columbus, Ohio 43210.

Phloem of the Lower Pennsylvanian fern *Etapteris* is described based on several isolated petioles discovered in coal balls from the Lewis Creek, Kentucky locality. Petioles are characterized by a clepsydroid-shaped exarch protosteles with tapered lateral arms and a broad apolar (=central bar). The majority of the stele consists of rectangular metaxylem tracheids with multiseriate-circular bordered pits, while protoxylem with annular-scalariform pitting occurs in the sinuses at either end of the apolar. A 1-2 cell thick parenchyma sheath separates the xylem from the extraxylary tissues. The phloem consists entirely of small sieve elements (20-30 µm in diam and 120-360 µm in length) with horizontal to slightly oblique end walls. In transmitted light, the radial cell walls of the sieve elements form an irregular reticulate pattern enclosing elliptical areas. These areas appear as horizontal - slightly oblique furrows on the cell wall, with many small indentations lining the furrows. These indentations, due to their regular occurrence and size (.2-1.25 µm) are interpreted as sieve pores, and the elliptical areas that enclose them as sieve areas. No evidence of callose has been found, and it is postulated therefore that the sieve pores of *Etapteris* were unobstructed at maturity. The phloem of *Etapteris* is compared with that described for other fossil genera.

## PLANT SCIENCES

- 10:15** FERTILE MARATTIACEOUS FOLIAGE FROM THE UPPER PENNSYLVANIAN OF OHIO. Sara P. Stubblefield. Department of Botany, Ohio University, Athens, Ohio.

Specimens of vegetative and fertile marattiaceous foliage preserved both by compression and pyritic cellular permineralization were collected from the base of the Monongahela group (Upper Pennsylvanian) in Athens County, Ohio. Frond segments are up to 10 cm long and consist of as many as three orders of branching. Vegetative pinnules are assignable to the genus *Pecopteris*, and measure 4-7mm long and 1.5-2mm wide. Fertile pinnules are of a similar size and shape, but bear two rows of synangia on the abaxial surface, one on each side of the midrib. One specimen demonstrates the transition from the vegetative to the fertile state and allows the correlation of both types of foliage. The radially symmetrical synangia consist of four or five sporangia and measure approximately 0.5mm long by 0.3mm in maximum diameter. They are attached to the pinnule by a short stalk. Individual sporangia are exannulate, fusiform, and fused laterally along most of their length. Sporangial walls are composed of one or two layers of elongate cells, and taper to an acute, cellular tip. No evidence of hairs has been observed. Spores are radial, trilete, round-oval, and range in size from 19-35µm. Specimens are typically collapsed, wrinkled and have thin, partially degraded walls. This material provides a unique opportunity to correlate marattiaceous reproductive structures found in the compressed state with anatomically preserved material.

- 10:30** THE GENUS *MITROSPERMUM* IN THE UPPER PENNSYLVANIAN OF OHIO. Gary Grove, Department of Botany, Ohio University, Athens, Ohio 45701

Numerous anatomically preserved ovules assignable to the genus *Mitrospermum* occur in Upper Pennsylvanian sediments of Ohio. Specimens are strongly platyspermic, up to 4.0mm long; 0.6mm thick and 4.0mm wide. In the minor plane, ovules are broadest at the base and taper gently toward the micropyle. The integument is delimited into three topographic regions; endotesta, sclerotesta, and sarcotesta. The sarcotesta is extremely broad in the major plane, where it forms two membranous wings. A single terete vascular bundle enters the base of the ovule, transverses the integument, and divides to form two integumentary bundles and a conspicuous nucellar platform. Integumentary bundles extend toward the tip of the ovule at the margin of the sarcotesta and sclerotesta. A pollen chamber with a prominent nucellar beak is delimited at the tip of the nucellus. The discovery of these ovules extends the stratigraphic range of *Mitrospermum* to the Upper Pennsylvanian of North America, and represents the first known occurrence of the genus in Ohio.

- 10:45** A NEW SPECIES OF COENOPTERID FERN FROM THE PENNSYLVANIAN OF NORTH AMERICA. Edith L. Smoot and Thomas N. Taylor. Botany Department, The Ohio State University, Columbus, Ohio 43210.

Isolated petiole segments of a new species of *Etapteris* are described from Lower Pennsylvanian age coal balls from the Lewis Creek, Kentucky locality. Specimens extend up to 15 cm in length and 5 mm in diam and exhibit a clepsydroid-shaped exarch proto-stele. In transverse section, the stele is characterized by lateral arms that taper sharply to a point, a broad apolar (=central bar), and the formation of a parenchymatous peripheral loop during pinna trace emission. Traces have not been observed beyond the outer cortex. Large, rectangular metaxylem tracheids with multiseriate-circular bordered pits make up the major part of the stele. Small protoxylem elements line the sinus at either end of the apolar and exhibit annular-scalariform pitting. Extraxylary tissues are well-preserved and consist of a 1-2 cell layer parenchymatous xylem sheath immediately external to the xylem, a zone of phloem cells, and a 3-parted cortex. Pinna traces originate on either side of the sinus and subsequently fuse to form a pinna trace bar, enclosing a peripheral loop just prior to separation from the stele. The pinna trace bar later divides to vascularize two separate pinnae. Scattered over the surface of the plant are multicellular hairs. When compared to other currently recognized coenopterid ferns, this new taxon appears to be intermediate in form between *Metaclepsydropsis duplex* and other members of the genus *Etapteris*, and may represent the most primitive species of the genus known to date.

11:00

CHARACTERIZING THE FOSSIL TRUE FERNS FROM THE PALEOZOIC OF NORTH AMERICA. Gar W. Rothwell. Department of Botany, Ohio University, Athens, Ohio.

The recent discovery of numerous permineralized frond segments in Upper Pennsylvanian sediments provides an opportunity to describe a new genus of the Serrmataceae, and further increase our knowledge of Paleozoic filicaleans. Specimens consist of up to three orders of biserially branched frond segments with abaxial curvature of the vascular bundle in proximal pinnae, and large sori of superficially borne sporangia on laminar pinnules. Sori occur on pinnule lobes adjacent to vascular bundles, and consist of about 25-35 sporangia. Individual sporangia are oblong, 0.6 mm long and 0.45 mm in maximum diameter, and are attached by a short, stout stalk. As in *Serrmatia*, the horizontal-oblique annulus consists of two rows of intergrading cells, and is interrupted at one side by a narrow band of longitudinally oriented, thin walled cells that presumably acts as a zone of dehiscence. Also as in *Serrmatia*, the vascular bundles have adaxially disposed protoxylem strands and crowded, bordered pits on walls of the metaxylem tracheids. Spores are radial, trilete, triangular in polar view, and measure 45-63  $\mu$ m in diameter. Material of this type helps clarify the relationships of the Filicales to some ferns that are currently assigned to the Coenopteridales.

## FIRST AFTERNOON SESSION, 1:45 P.M.

Oelmann 103

HAROLD W. KELLER, Presiding

1:45

THE EFFECT OF FREEZING AND THAWING ON THE TRANSPORT AND RETENTION OF AMINO ACIDS BY *ESCHERICHIA COLI*. Susan M. Steenbergen and Peter H. Calcott, Department of Biological Sciences, Wright State University, Dayton, Ohio, 45435.

When *E. coli* is frozen under either "slow" or "fast" freezing conditions and thawed a proportion of the population fails to divide on a rich medium. Of the survivors, a further portion also fails to divide when stressed with agents such as deoxycholate, sodium chloride and Actinomycin D. These cells are termed structurally injured. Given appropriate conditions, these cells are capable of repairing the damage and regaining the ability to divide on these media. When frozen and thawed, cells energized by various electron-donors partially lose the capacity to transport an amino acid mixture. Stressing agents show the cells to be further damaged when measured by transport capacity. When repaired, cells are capable of transporting the nutrients at rates comparable to that of unfrozen cells. Once the amino acids are transported into the cells (preloaded), they are retained at high levels. Frozen cells lose a proportion of and the ability to retain these compounds especially under stressing situations. Repaired cells transport the released material and retain these nutrients to levels comparable to unfrozen cells.

This research was supported by a National Institutes of Health Biomedical Grant to Wright State University and Peter H. Calcott (No. 1-507-RPO-7155-01).

1:55

THE CORTICOLOUS MYXOMYCETES OF OHIO. Harold W. Keller, Department of Biological Sciences, Wright State University, Dayton, Ohio 45435.

Corticolous Myxomycetes are those slime molds that grow and fruit on the bark surface of living trees and vines. Species of *Juniperus*, *Ulmus*, and *Vitis* support the greatest number and diversity of corticolous Myxomycetes. Collection of corticolous Myxomycetes began in Ohio in 1974 supported by a grant from the Ohio Biological Survey. Thus far over 550 specimens representing 65 species have been collected and of these, 34 species are new records for the state of Ohio. Fieldwork was centered in the southwestern portion of Ohio in the counties of Scioto, Adams, Brown, and Greene because of the abundance of *Juniperus virginiana*, especially near gravesites in cemeteries. A number of new species were described including *Badhamia rugulosa*, *Didymium orthomemata*, *D. synsporon*, *Echinostelium coelocephalum*, *Licea inconspicua*, *L. scyphoides*, and at least eight new species await description. Species once thought to be quite rare such as *Arcyria nigella*, *Badhamiopsis ainoae*, *Glastoderma pachypus*, *Comatricha fimbriata*, *Cribraria minutissima*, *Diderma chondrioderma*, *D. rugosum*, *Echinostelium elachiston*, *E. fragile*, *E. minutum*, *Lamproderma biasperosporum*, *Licea castanea*, *L. kleistobolus*, *L. marginata*, *L. operculata*, *L. parasitica*, *L. pedicellata*, *Macbrideola cornea*, *M. decapillata*, *Minakatella longifila*, *Perichaena minor*, *Physarum bogoriense*, *P. crateriforme*, *P. roseum*, are either common or were found at least once. It is now apparent that the bark of living trees and vines, from near ground level to treetop, is a unique habitat with a distinctive Myxomycete biota.

## PLANT SCIENCES

- 2:10** THE MYXOMYCETES OF KENTUCKY: A PROGRESS REPORT. Patsy J. Ford, Department of Biological Sciences, Wright State University, Dayton, Ohio 45435.

Collection of Myxomycetes in Kentucky began the fall of 1977 in the counties of Boone, Carter, Fleming, Franklin, Greenup, Henry, Owen, Scott and Shelby. Thus far approximately 20 species of Myxomycetes have been collected and these species represent the first composite list of Myxomycetes from Kentucky. Fieldwork will be concentrated in forested areas of northern and northwestern Kentucky and in the area known as "The Land Between the Lakes". Bark samples obtained from living trees such as species of Juniperus, Ulmus, Quercus, Fraxinus and species of vines such as Vitis have been cultured in the laboratory using the moist chamber technique. A number of corticolous Myxomycetes have been harvested from moist chamber cultures. The following species have already been found in Kentucky: Badhamiopsis ainoae, Dictydiaethalium plumbeum, Diderma corrugatum, Didymium synsporon, Echinostelium arboreum, Licea denudescens, L. inconspicua, L. marginata, L. perexigua, L. pseudoconica, L. scyphoides, Lycogala epidendrum, Macbrideola cornea, M. martinii, Metatrichia vesparium, Minakatella longifila, Physarum crateriforme, Reticularia splendens, Trichia erecta, and T. favoginea. Hopefully, many new species will be found and rare and poorly known species further described.—Research supported by Grants BMS 75-19098 and DEB 75-19098A01 from the National Science Foundation.

- 2:20** A POSSIBLE NEW CELLULAR SLIME MOLD GENUS, HETEROSPHONDYLIIUM. James C. Cavender, Department of Botany, Ohio University, Athens, Ohio 45701

Traub and Hohl (1976) have proposed a new genus, Heterosphondylium, for the family Dictyosteliaceae which would occupy an intermediate position between Polysphondylium and Dictyostelium. Certain associated morphological and biochemical characteristics, e.g. smaller size, clustered sorocarps, irregular branching, polar spore granules and chemical attractant other than cyclic AMP, were advanced to support this concept. The author has studied two new species, to be described as Dictyostelium aureo-stipes and D. tenuis, which possess the above features and which also display greater environmental sensitivity than is found in D. discoideum or other more robust members of the genus. Continued study of all the intermediates may provide additional support for the concept. However, until such a study is carried out a change in the taxonomy of the cellular slime molds at the generic level should not be made.

- 2:35** THE ULTRASTRUCTURE OF SPORANGIAL DEVELOPMENT OF WORONINA PYTHII. Daniel P. Dylewski, Charles E. Miller and James P. Braselton. Dept. of Botany, Ohio University, Athens, Ohio 45701.

Woronina pythii Goldie-Smith is a member of the Plasmodiophoromycetes, obligately parasitic, holocarpic, endobiotic, fungi exhibiting cruciform nuclear division during vegetative growth. The aquatic fungus genus Pythium is parasitized by W. pythii. Woronina pythii and Pythium sp. were identified and isolated in 2-member culture from several soil samples collected in Cassopolis, Michigan.

Morphological changes in the development of zoosporangia were studied using both light and transmission electron microscopy. The cytoplasm of sporangigenous plasmodia contains mitochondria, endoplasmic reticulum, vacuoles, ribosomes, lipid globules, centrioles and dictyosomes. Interphase nuclei have centrally situated nucleoli and a 2-unit membrane nuclear envelope. Plasmodia have a thick outer membrane while actively growing and ingesting host cytoplasm and organelles. Prior to cleavage of the mature plasmodium into a multilobed zoosporangium, the thick outer membrane becomes thinner, nuclei become smaller, and their nucleoli become dispersed throughout the nucleoplasm. Zoosporangia consist of many internal, interconnected, spherical lobes that are separated by thin cross walls that disintegrate as the sporangium matures. The protoplasm within each lobe cleaves into 4-12 biflagellate zoospores which escape from the mature zoosporangium through peripherally situated lobes that develop exit papillae. The uninucleate sporangigenous zoospores are 3.2-3.8 X 4.0-4.2  $\mu$ diam. and contain lipid globules, vacuoles, mitochondria, dictyosomes, and vesicles.

- 2:50 MICROFUNGI FROM BLACK WALNUT BARK IN SOUTHEASTERN OHIO. Emanuel D. Rudolph, Anita Johnson, and Lynn M. Kuhel, Department of Botany, The Ohio State University, Columbus, Ohio 43210.

Bark samples from black walnut trees of three different sites in southeastern Ohio were used to isolate microfungi in pure culture. One hundred sixty six different cultures were obtained belonging to 60 different fungal taxa. The most widespread and common genera were: Alternaria, Cladosporium, Epicoccum, Fusarium, Mucor, Penicillium, Pestalotia, and Trichoderma. The species were typical cosmopolitan or wood inhabiting types. No significant differences were found among sites even though bark pH was different. Scanning electron microscopy indicated greater amounts of fly-ash with greater bark acidity. In all sites, fungal hyphae were found, but very few spores that could be directly related to the isolated forms. It is suggested that microfungal sporulation is rare on black walnut bark.

- 3:05 THE BIOLOGY OF THE MOSS LORENTZIELLA IMBRICATA. Ann E. Rushing. Department of Biological Sciences, University of Cincinnati, Cincinnati, Ohio 45221

The gametophyte of the moss genus Lorentziella is annual and grows in the fall from an extensive system of perennial underground tuber-like structures. Several clusters of antheridia occur in the axils of broad concave stem leaves and archegonia are usually terminal. Fertilization occurs in late fall (October-December) and sporophytes are mature by mid-winter (February). The globose capsule of the sporophyte has a thick fleshy wall and lacks an operculum. No calyptra is present. Mature spores are large and spherical and are produced in small numbers. The capsule wall disintegrates for spore release.

- 3:15 CYTOKININ EFFECTS ON BUD INITIATION AND PROTEIN SYNTHESIS IN THE MOSS MICRODUS MIQUELIANUS. Leslie Wanner, Department of Botany, Ohio State University, Columbus, Ohio 43210.

Gametophore buds are initiated in the protonemata of the moss Microdus miquelianus when they are transferred from the basal medium to a medium containing 5 mg./l. of a cytokinin, benzylaminopurine. Daily transfer of the protonemata from cytokinin-containing medium to basal medium showed that a substance or substances necessary for bud initiation is synthesized within the first two days of cytokinin action, though buds appeared at eight to nine days. Simultaneous addition of 1 mg./l. of the cytoplasmic protein synthesis inhibitor cycloheximide with the cytokinin inhibited bud initiation in the protonemata, suggesting that synthesis of some new protein is necessary for this morphogenetic event. However, the rate of protein synthesis in protonemata in the cytokinin medium as studied by incorporation of tritiated leucine was significantly lower than in the basal medium, indicating that the protein(s) involved in bud initiation are probably small amounts of some critical enzymes. Continuous labelling of the protonemata in tritiated leucine showed a steady decrease in the radioactivity in protein over a thirty day period, with no clear difference between basal and cytokinin medium. This indicates that continued degradation of proteins occurs simultaneously as new proteins are synthesized.

- 3:30 SEASONAL CHEMICAL AND PHYSICAL VARIATIONS IN SPHAGNUM AND SPHAGNUM SUBSTRATE. Peter F. Spatt. Dept. of Biological Sciences, Univ. of Cincinnati, Cincinnati, Ohio. 45221.

Studies were conducted of Sphagnum capillaceum var. tenellum and its substrate relations in two uniform areas on the North Slope of Alaska from the end of June to mid-August, 1977. Seasonally, decreases were noted in relative water percent and chlorophyll a content of Sphagnum. In the water extracted from Sphagnum and its substrate, conductivity and pH increased and concentration of calcium ions increased seasonally during the dry mid-summer period. In dust impacted areas near the Alaska Pipeline Haul Road many of these changes were magnified. Net primary productivity was inhibited by a dust cover as indicated by carbon-14 uptake.

## PLANT SCIENCES

3:40

CHROMOSOME STUDIES OF MOSSES OF THE INTERIOR OF NORTH AMERICA. Jerry A. Snider. Department of Biological Sciences, University of Cincinnati, Cincinnati, Ohio 45221.

Approximately one-fourth of the moss taxa in North America have been studied cytologically. The overwhelming majority of these studies have dealt with moss populations occurring from the Appalachians and eastward or from the Rocky Mountains and westward. Cytological studies of moss populations from the neglected interior of North America have now been initiated. Currently chromosome numbers for 68 taxa representing 48 genera and 25 families have been completed. Counts for 36 of the 68 taxa are new reports for North America. Twenty-five of the 36 taxa represent counts new to science. Fourteen of the 25 taxa represent newly discovered aneuploid or tetraploid races of species for which counts have previously been published, and 11 of the 25 taxa are species for which no previous counts have been made. Of the 68 taxa studied cytologically, 47 exhibit supernumary "m" bivalents.

3:50

PRELIMINARY ULTRASTRUCTURAL OBSERVATIONS ON THE DEVELOPMENT OF THE AUXOSPORE OF THE FRESHWATER DIATOM CYCLOTELLA MENEHINIANA. H. J. Hoops and G. L. Floyd, Botany Department, The Ohio State University, 1735 Neil Ave., Columbus, Ohio 43210.

The auxospore wall appears to be similar to that of *Melosira*, another centric diatom previously studied. The auxospore wall of *C. meneghiniana* is, however, fragile. Early frustule formation can be observed just beneath the auxospore wall. Cytological features differ little between the auxospore and the vegetative cell. Both contain doughnut shaped mitochondria. The auxospore also contains a very large vacuole that occupies more than 90% of the cell volume. An extranuclear spindle is formed between two plates (polar complexes) as in normal vegetative cell division. Other events associated with the development of the auxospore will be described.

4:05

PLANT "MUSCLE" PHYSIOLOGY, BIOCHEMISTRY, AND ULTRASTRUCTURE: THE RHIZOPLAST OF PLATYMONAS. J. L. Salisbury and G. L. Floyd, The Ohio State University, Department of Botany, 1735 Neil Ave., Columbus, Ohio 43210.

The rhizoplast of the green alga *Platymonas subcordiformis* is a banded fibrous root which occurs associated with the flagellar apparatus. Ultrastructurally, the organelle has a striking similarity to muscle fibers. We demonstrate that the rhizoplast is a contractile organelle and propose a functional relationship to flagellar locomotion - that of initiation of bend wave propagation. Contraction of the rhizoplast is triggered by calcium and appears to proceed by a polar disassembly of the filamentous components which make up the extended organelle, rather than a sliding filament mechanism as in animal muscle systems. Isolation, macromolecular characterization, calcium cytochemical localization, ultrastructure and function of the rhizoplast will be discussed.

## SECOND AFTERNOON SESSION, 1:45 P.M.

Oelman 119

IRWIN A. UNGER, Presiding

1:45

A NUMERICAL ANALYSIS OF PHENOLIC VARIATION IN A HYBRID CONTAINING POPULATION OF *QUERCUS*. Judith F. Knops and Richard J. Jensen. Department of Biological Sciences, Wright State University, Dayton, OH 45435.

A previous numerical taxonomic study of morphological data from a population of *Quercus* subgenus *Erythrobalanus* allowed recognition of three species and several putative hybrids. Chromatographic methods were used to survey phenolic variation in these same trees to determine if similar patterns of relationship would be evident. Leaves of approximately equal sizes from each tree were extracted in methanol and the extracts analyzed by standard two-dimensional paper chromatography. Spots on the chromatographs were characterized by viewing under ultra-violet light before and after fuming with ammonium hydroxide and by calculating  $R_f$  values. Chromatographs for each tree were then coded present-absent for each spot. A matrix constructed from these data was used to prepare cluster and principal component analyses. The resultant phenogram and ordination produced patterns almost identical to those derived from only morphological data. These results provide additional support for the conclusion that there is hybridization involving all three species in this population.

2:00

MULTIVARIATE ANALYSIS OF MORPHOLOGICAL VARIATION IN THE PENNISETUM PEDICELLATUM - P. POLYSTACHION COMPLEX IN TROPICAL AFRICA. Jere N. Brunken, Department of Botany Ohio State University, Columbus, Ohio 43210.

The Pennisetum pedicellatum - P. polystachion complex comprises a morphologically variable group of annual and perennial grasses. Members of this complex represent one of the most common components of ruderal plant communities in tropical Africa. The complex pattern of morphological variation exhibited by this group has proven to be taxonomically difficult. To aid in understanding these patterns and to resolve the taxonomic problems in the group, a multivariate analysis (BMD07M) was performed for 177 collections representing the range of variation present in tropical Africa. The results indicate the presence of two morphologically distinct subgroups within the complex. Variation within each of these subgroups is both extensive and essentially continuous. The implications of these results in regards to the classification of the complex are discussed.

2:15

SYSTEMATICS OF THE OROPHACA ASTRAGALI. Marvin L. Roberts, Department of Botany, The Ohio State University, Columbus, Ohio 43210.

Astragalus section Orophaca contains seven currently recognized species found in eroded grassland habitats mostly on the eastern slope of the Rocky Mountains. Biochemical studies show the section to be somewhat unusual in the genus, but not so distinctive as to support generic delimitation as previously proposed on morphological grounds. Chromosome numbers are reported for each species and all are diploid ( $n=12$ ). B-chromosomes have been found in one population of a common species but cannot be correlated with other distinctive features of these plants. Features of the fruits and seeds are presented and can be related to the taxonomy of the genus now that they are available for all taxa. Two geographic isolates of the most widespread species in the genus exhibit discontinuities in morphological variation. These allopatric entities merit taxonomic recognition. Chemical studies of leaf flavonoids and seed proteins indicate differentiation among populations of each species. This variation does not show strong correlations with morphological variation or geographic distribution and may be related to the discontinuous nature of the suitable habitats.

2:30

THE USE OF CHARACTER COMPATIBILITY FOR GENERATING HYPOTHESES OF PHYLETIC RELATIONSHIPS AMONG SEVERAL SPECIES OF CHENOPODIUM. John La Duke\* and Daniel J. Crawford, Department of Botany, The Ohio State University, Columbus, Ohio 43210.

The method of Character Compatibility, using both morphological and chemical features, was employed to develop a phylogeny for several closely related species of Chenopodium occurring in the western United States. These species are C. atrovirens, C. hians, C. desiccatum, C. fremontii, C. incanum (which includes two varieties in addition to the typical one), C. leptophyllum, and C. pratericola. The three phylogenies produced by character compatibility were compared to an hypothesis of phyletic relationships derived intuitively. These relationships are the same except for the position of C. desiccatum. The four phylogenies developed will be presented, supported by the characters used to develop each. Probable reasons for differences in the phyletic position of C. desiccatum in each scheme will be discussed and analysed.

2:45

CHEMICAL VARIATION IN CHENOPODIUM FREMONTII: THE CONCORDANCE OF ALLOZYME AND FLAVONOID DATA. Daniel J. Crawford, Department of Botany, The Ohio State University, Columbus, Ohio 43210.

Chenopodium fremontii is a widespread species which occurs throughout much of the western United States. Selected populations from throughout much of the range of the species were examined for flavonoid compounds in the leaves and for allozymes of glutamate-oxaloacetate transaminase (GOT), phosphoglucosomerase (PGI) and leucine aminopeptidase (LAP). The pattern of geographic variation in secondary compounds is similar to the pattern observed for allelic frequencies at several loci coding for enzymes. Plants from the northern range of the distribution of C. fremontii (western Nebraska, Wyoming, northern Colorado) synthesize an array of flavonol 3-O-glycosides which differ consistently from flavonols produced by plants from New Mexico, Arizona, and southern Colorado. Populations of C. fremontii from southern California are very similar in flavonoid components to those from Arizona and New Mexico. With respect to allozymes, plants from western Nebraska, Wyoming, and northern Colorado differ from those in New Mexico, Arizona, and California in allelic frequencies at one gene for PGI and one locus for GOT. No morphological features by which to distinguish the two chemical-geographic races of C. fremontii have been found.

## PLANT SCIENCES

3:00

MORPHOLOGICAL AND CHEMICAL VARIATION IN TWO TAXA OF OSMORHIZA (UMBELLIFERAE). Carol P. Ostertag and Richard J. Jensen. Department of Biological Sciences, Wright State University, Dayton, OH 45435.

Osmorhiza claytonii and O. longistylis, two taxa of Umbelliferae, are sympatric throughout much of their respective ranges yet reputedly do not occur in mixed populations. They are recognized as distinct species despite their almost identical appearance. The discovery of a mixed population displaying overlap in most morphological characters, implying the possibility of hybridization, provided the stimulus for this study. Four populations, two mixed and two consisting solely of O. longistylis, were analyzed by way of two-dimensional paper chromatography of leaf phenolics and numerical taxonomic analyses of seventeen morphological characters. Cluster analyses and principal component analyses allow recognition of the two species both in single populations and when all OTU's are analyzed simultaneously. The separation is primarily the result of a few characters with a high degree of overlap evident in the remainder. Comparison of chromatographic profiles permits essentially the same separation of individuals, although not as well-defined as that produced by the morphological data. These analyses suggest that the two taxa do represent distinct species.

3:15

THE FLAVONOID CONSTITUENTS OF TITHONIA DESF. John La Duke, Dept. Botany, The Ohio State University, Columbus, Ohio 43210

Tithonia Desf., a genus of the Compositae with twelve species, is distributed throughout Mexico and Central America. The purpose of this study is to investigate leaf flavonoid compounds and relate the results to systematic relationships within the genus. At present, over twenty flavonoid compounds have been isolated using paper and thin-layer chromatography. Glycosides of the flavonols Quercetin and Kaempferol are common to many species, while some species such as T. koelzii possess less common chalcones and aurones as major constituents. Perennial species, which are closely related morphologically, possess simple, similar profiles, while the weedy annual species have complex, diverse profiles. Profile data as well as compound identifications will be used to propose phylogenetic relationships in this genus.

3:30

REPRODUCTIVE EFFORT IN POLYGONUM PENNSYLVANICUM L. (POLYGONACEAE). W. Randy Kubetin and Barbara A. Schaal, Department of Botany, The Ohio State University, Columbus, Ohio 43210.

Seeds of the annual smartweed Polygonum pennsylvanicum were collected from six populations in habitats ranging from relatively undisturbed to highly disturbed. Plants were grown from seed in the greenhouse under uniform conditions, harvested at maturity, and air dried to constant weight. Reproductive effort was calculated as the ratio of dry weight of the reproductive structures to total dry weight. Mean reproductive efforts for each population were compared using a one-way ANOVA. Populations showed significant differences in reproductive effort and these differences are related to habitat type.

3:45

REPRODUCTIVE EFFORT IN FOUR OLD-FIELD PLANT SPECIES. Carmen R. Cid-Benevento and Barbara A. Schaal. Department of Botany, The Ohio State University, Columbus, Ohio 43210.

Reproductive effort was determined for populations of Solidago canadensis L., Aster pilosus Willd., Aster novae-angliae L. and Dipsacus sylvestris Huds. in habitats of varying successional stage. Total reproductive effort per population was measured by the ratio of reproductive biomass to total above-ground biomass. Successional maturity was determined by habitat disturbance and species diversity. Reproductive effort in Aster pilosus and Dipsacus sylvestris was high in the most disturbed areas, was even greater in intermediate habitats and low in the most successional mature habitats. There was a decrease in reproductive effort in Solidago canadensis and Aster novae-angliae with increasing successional stage.



- 4:00 PHLOX, GOPHERS, AND THE MAINTENANCE OF OPEN COMMUNITIES. Wesley J. Leverich.  
Department of Botany, The Ohio State University, Columbus, Ohio 43210.

Phlox drummondii Hook., a winter annual, occurs in sandy soils of south and south-central Texas. Pocket gophers of the genus Geomys likewise occur in sandy soils. In the course of extensive field study, over 200 naturally occurring populations of P. drummondii were observed, and there was evidence of gopher activity in each. Although some gopher sites were located where P. drummondii was not present, no naturally occurring populations of P. drummondii were found in absence of gopher activity. At these sites, the plant community is typically rich in annuals and poor in perennials, much like a disturbed or temporary habitat. However, a hypothesis is proposed which suggests that these habitats are maintained indefinitely in a "disturbed" condition through the activities of pocket gophers, and at least some annual plants are adapted to persist in an open but stable community.

## C. SECTION OF GEOLOGY

FIRST MORNING SESSION, SATURDAY, APRIL 22, 9:00 A.M.

Fawcett 218

Vice President, JOHN HILLERUD, Presiding

- 9:00 ICE SHEET DYNAMICS.  
I. M. Whillans, Department of Geology & Mineralogy, and Institute of Polar Studies,  
The Ohio State University, Columbus, Ohio 43210.

The dynamics of ice sheets must be understood in order to properly interpret the sedimentary stratigraphy of deep ice cores, calculate the control that glaciers have on world sea level, and understand the mechanics of glaciations and the meaning of glacial deposits.

Recent work on the west antarctic ice sheet is described. Measurements of glacial velocity have been made using artificial satellites and this velocity has been compared with the snow accumulation to calculate ice thickness changes. Radar sounding of the ice sheet has detected internal layering associated with the sedimentary stratigraphy, and studies of these have confirmed certain theories of ice flow and describe the long-term mass balance of the ice sheet. The snow accumulation is obtained from the depth of nuclear bomb fallout horizons and other measurements of the snow stratigraphy are used to calculate moisture source areas and assess precipitation mechanisms.

The studies show that the west antarctic ice sheet is thinning slowly in the center and expanding at the margins. The probable cause of this activity is discussed.

- 9:30 STATISTICAL PETROLOGY OF TILLS OF THE KILLBUCK LOBE, WAYNE COUNTY, OHIO  
Susan C. Gordon, College of Wooster, Wooster, Ohio 44691

This study is an attempt to evaluate the nature and abundance of specific indicator rock types present in Wisconsin tills, kames and outwash gravels of the Killbuck lobe in Wayne County, Ohio. Data was provided from pebble counts of random till and kame samples. The indicator rock types, when traced to their source deposits, provide helpful information about the probable path of early and late Wisconsin ice sheets. The percentages of specific rock types (sandstone, carbonates, chert, and concretions) in the pebble count samples can distinguish till sheets of different ages. Late Wisconsin till sheets have a noticeably higher carbonate percentage and a relatively lower sandstone percentage than early Wisconsin till sheets. This approach to tills and gravel deposits provides a different method of dating many kame deposits mapped by White (1967).

Those indicator rock types most useful to the study include: Anorthositic, green Huronian tillites of the Gowganda Formation or the Chibougamau Group, red and white orthoquartzitic sandstone of the Potsdam Formation, coarse-grained highly metamorphosed marbles, garnet-bearing rocks and amphibolites. Many of these rock types have their source deposits in the Grenville Province of Canada. From these indicator, two sources are suggested: early Wisconsin having an eastern source and late Wisconsin having a western source.

## GEOLOGY

- 9:40 MORPHOLOGICAL, CHEMICAL AND MINERALOGICAL PROPERTIES OF SOIL NODULES IN CALCREOUS TILL PLAIN SOILS IN MADISON COUNTY OHIO.  
Martin L. Schmidt, Ohio State University, Department of Agronomy, 1885 Neil Avenue  
Columbus, Ohio 43210

One of the principle objectives of this research project was to observe morphological, chemical, and mineralogical properties of soil nodules found in a toposequence of soils developed in calcareous glacial till in west central Ohio.

Concretionary type materials were found only in the poorly drained and somewhat poorly drained soils and were classified as true soil nodules having undifferentiated internal fabric. They were dark reddish brown in color (5YR 3/3), subrounded in shape, less than 3 mm in diameter and easily crushed when moist. Chemically, the nodules were enriched with iron, manganese and aluminum when compared to the surrounding soil. Mineralogically, the nodules were composed entirely of x-ray amorphous iron and manganese with inclusions of quartz and feldspar. Scanning electron micrographs indicated the amorphous components were not segregated within the nodules.

- 9:50 THE GASTROPOD GENUS ?MICROPTYCHIS LONGSTAFF IN THE PENNSYLVANIAN OF OHIO. R. D. Hoare and M.T. Sturgeon. Department of Geology, Bowling Green State University, Bowling Green, Ohio 43403 and Department of Geology, Ohio University, Athens, Ohio 45701

The genus Microptychis is a questionable member of the family Pseudozygopleuridae Knight. Protoconch features, which are characteristic of the family, have not been seen on the type specimens. M. ? cerithiformis (Meek and Worthen) has been previously reported from the Vanport marine unit. Five new species of pseudozygopleurid gastropods occur in the Putnam Hill and Columbiana marine units of the Allegheny Group which may belong to the genus Microptychis. If it is determined that Microptychis is not a pseudozygopleurid then a new generic designation will be necessary for these species. Another new genus and species of gastropod from the Putnam Hill unit shows homeomorphic features of Microptychis but has a different protoconch structure and is not a pseudozygopleurid.

- 10:00 REGENERATION IN DORSAL-CUP PLATES OF SOME PENNSYLVANIAN CRINOIDS  
John J. Burke, The Cleveland Museum of Natural History, Wade Oval, University Circle, Cleveland, Ohio 44106

Although dorsal-cup plates of Pennsylvanian inadunate crinoids bear abundant evidence of damage by boring organisms, it is only recently that I have found evidence of regeneration of portions of plates damaged in this way. We now have conclusive evidence that borings were made during the lifetimes of certain crinoids. The borings, which appear to have been inflicted by gastropods, are usually somewhat broad and do not appear to have been particularly deep. They appear on crinoid cups which have crowded ornament consisting of small nodes or tubercles. Regeneration was accomplished by gradually filling in the bowl-shaped borings with close-packed, but initially smaller, nodes of the same type that characterized the original ornament. In most cases size of nodes increased as regeneration proceeded, but even when they became flush with the cup surface they usually remained somewhat smaller and more close packed than the neighboring original nodes. The following species showing this type of ornament are illustrated: Delocrinus graphicus M. & P., Ames Limestone, Conemaugh Group, Pennsylvania; Delocrinus cf. graphicus M. & P., Thrifty Formation, Texas; Stenopeocrinus moseleyi (Strimple) Ocheleta Formation, Oklahoma; and Delocrinus brownvillensis Strimple, Harpersville Formation, Texas. It is characteristic of D. brownvillensis that with increasing age the original ornament was eliminated. It is particularly interesting that one of the illustrated cups of this species shows rejuvenated ornament in areas devoid of the original.

- 10:15** ANALYSIS OF SELECTED MULTITUBERCULATE TEETH FROM THE BUG CREEK FAUNA, MONTANA.  
Vanessa L. Schall and John M. Hillerud, Department of Geology, Capital University, Columbus, Ohio.

In 1972, Hillerud participated in an University of Nebraska State Museum fossil-collecting expedition in Montana which obtained a large sample of microvertebrate-bearing sediment concentrate from the well-known "Bug Creek Anthills" locality, near the Fort Peck Reservoir, McCone County, Montana. The fauna is stratigraphically defined as "Late Cretaceous localities of Paleocene aspect ... Bug Creek horizon(s), upper part of the Hell Creek Formation ... underlying the Paleocene Tullock Formation" (Sloan and Van Valen, 1965). Hillerud brought a teaching sample of this concentrate to Ohio where laboratory groups have picked the organic materials from it. In 1977, Schall selected samples of 28 upper M-1 and 30 lower P-4 teeth from the collected organic remains, mounted, accessioned and measured them, and treated the measurements to computer-generated univariate analysis.

Counts of serrations on the P-4 teeth allowed initial diagnosis of two species of multituberculates; *Mesodma thompsoni* and, tentatively, *Stygimys kuszmauli*. Measurements and statistics are presented verbally and graphically for these subsamples. Macrophotographs (by C. Estep and Hillerud) of selected teeth illustrate the diagnostic characters.

Teeth and limb elements of other species, including Didelphid marsupials and (?) Condylarth forms are present in the remains; ganoid scales of gar-pike, salamander, turtle and crocodile teeth and dermal ossicles are also common.

- 10:45** PRELIMINARY REPORT ON THE PENNSYLVANIAN FISHES OF OHIO: PART I, CHONDRICHTHYES AND ACANTHODII  
Michael C. Hansen, Ohio Division of Geological Survey, Columbus 43224  
and Myron T. Sturgeon, Ohio University, Athens 45701

Analysis of chondrichthyan and acanthodian remains from the Pennsylvanian System of Ohio indicates that at least 23 genera of chondrichthyans and one genus of acanthodians are represented in collections from 23 stratigraphic horizons at 94 localities distributed throughout 22 counties in southern and eastern Ohio. These remains, totaling nearly 1,000 specimens, consist almost exclusively of isolated teeth, dermal spines and ossicles, and coprolites. The specimens are repositied principally at Orton Museum, The Ohio State University, and the Cleveland Museum of Natural History.

Chondrichthyans are represented by eight genera of petalodonts, four genera of coelodonts, two genera of cladodonts, five genera of dermal spines, one genus each of edestids, helodonts, pleuracanth, and dermal denticles. Acanthodians are represented by fin spines and scales probably referable to a single genus.

This large and diverse assemblage permits taxonomic revision of many genera that have not been evaluated for nearly a century and provides an important record of the stratigraphic distribution of these fishes in the Pennsylvanian rocks of Ohio. Several genera are newly reported for Ohio.

- 11:00** PRELIMINARY REPORT ON THE PENNSYLVANIAN FISHES OF OHIO: PART II, OSTEICHTHYES  
Ted M. Cavender, Ohio State University Museum of Zoology, Columbus, 43210

This report encompasses a study of fossil material in the Orton Museum collections at Ohio State University plus a critical review of the literature records on the Pennsylvanian osteichthyan fauna of Ohio.

There are seven genera represented in the collections from nine stratigraphic horizons at thirteen localities (distributed over eleven counties). An additional four genera and five localities are found in the literature but specific locality information is not provided.

Rhipidistian *Crossopterygii* are identified from very incomplete remains such as isolated teeth and scales of *Megalichthys* and an undetermined rhizodontid. The coelacanth *Rhabdoderma* is represented by articulated specimens at Linton, Ohio as well as the dipnoan *Sagenodus*. Of five paleonisciform genera four occur in the Linton cannel-shale. The best known are *Haplolepis*, *Pyritocephalus*, and *Elonichthys*. one new paleonisciform from the Columbiana Unit, Allegheny Group is added to the list for Ohio.

Most of the osteichthyan taxa were reported during the last century with little information added since then. The largest number of new finds have been remains of disarticulated paleonisciforms.

## GEOLOGY

- 11:15 ANALYSIS OF A SAMPLE OF WHITE-TAILED DEER FROM A FORT ANCIENT MIDDEN, WARREN COUNTY, OHIO.  
Donn L. Davids, Ohio Historical Center, Columbus, Ohio, Jack A. Klotz and John M. Hillerud, Department of Geology, Capital University, Columbus, Ohio.

A sample of mandibular rami of the white-tailed deer, *Odocoileus virginianus*, were selected from specimens in the private collections of Clifford Anderson of Fort Ancient, Ohio, who excavated prehistoric middens of the Fort Ancient Culture, Anderson Focus, 1200-1400 A.D., in the years 1890-1920. These collections, and Anderson's field-journal, were acquired by the O.H.C. in the 1930's, but remained in a local museum until May, 1976, when they were removed to the Columbus facility of the Ohio Historical Center by Davids.

In September, 1977, Klotz selected, prepared, acquisitioned and measured the deer-jaw sample from the field-collection. Measurements of age-class subsamples were treated to computer-generated univariate analysis (PROGRAM BIESTAT, Hillerud, 1974), to determine the type and range of variation of a "wild" population not affected by present-day environmental stresses. Measurements and statistical data from the sample are presented verbally and graphically.

Most subsamples based on age-groups displayed an excessively "normal" distribution. However, the mortality curve derived from the sample suggests the following conclusions: the deer population was exploited throughout the year, predation levels were lowest in the spring and early summer, and prehistoric inhabitants selectively hunted mature deer rather than the juvenile segment of the population (see, e.g., Krantz, 1970).

## 11:35 A.M. BUSINESS MEETING

### SECOND MORNING SESSION, 9:00 A.M. Fawcett 222 Membership Chairman, PAUL PUSHKAR, Presiding

- 9:00 A PALEOECOLOGICAL ANALYSIS OF THE CAMBRIDGE LIMESTONE (UPPER PENNSYLVANIAN)  
Mark A. Wilson, Department of Geology, The College of Wooster, Wooster, Ohio 44691

A paleoecological study of the Cambridge Limestone (Upper Pennsylvanian) in Guernsey County, Ohio, indicates that the Cambridge marine event began with a rapid transgression, followed by a long stillstand, and ended with a rapid regression. The fauna was characterized by low diversity and a high degree of opportunism. The taxonomic diversity apparently had little relationship to the depth of water. Five benthic organism associations were found by using a correlation matrix as employed by De Keyser (1977). One of the main controlling factors for species succession and replacement in the Cambridge Limestone was the stability of the substrate.

- 9:15 CEMENTATION HISTORY OF OSAGEAN AND LOWER MERAMECIAN CARBONATES:  
SOUTHERN INDIANA, CENTRAL AND EASTERN KENTUCKY  
D. Joe Benson, University of Cincinnati, Cincinnati, Ohio  
(Present address: Lake Erie Section, Ohio Division of  
Geological Survey, Box 650, Sandusky, Ohio 44870)

Examination of over 200 thin sections of Osagean and Lower Meramecian grainstones and packstones from southern Indiana and central and eastern Kentucky suggests that many of the rocks were originally deposited as medium- to coarse-grained carbonate sands with high initial porosity. In most cases, however, this porosity has been almost completely destroyed by cementation. Three morphologically distinct types of cement have been recognized: (1) a fine-grained prismatic or "dog-tooth" spar, (2) a coarser, granular cement, and (3) a coarse syntaxial rim cement. Detailed examination of these cement types by staining and cathode luminescence techniques suggests that the prismatic cement represents cementation in a marine environment early in the diagenetic history of the rocks, while the granular and syntaxial rim cements are of a later phreatic origin.

9:30

ISOTOPIC COMPOSITIONS OF STRONTIUM, LEAD, SULFUR, AND CARBON OF SECONDARY MINERALS FROM NORTH-WESTERN OHIO. G. Faure and J. M. Haden, Department of Geology and Mineralogy, The Ohio State University, Columbus, Ohio, 43210.

The  $^{87}\text{Sr}/^{86}\text{Sr}$  ratios of secondary calcite, strontianite and fluorite, collected from several quarries in north western Ohio, have a mean of  $0.70829 \pm 0.00048$  and are not distinguishable from the  $^{87}\text{Sr}/^{86}\text{Sr}$  ratios of the dolomite host rocks (Lockport and Detroit River) whose mean is  $0.70838 \pm 0.00044$ . These results permit the conclusion that the Sr in these minerals originated from the dolomite host rocks. The isotopic composition of lead in galena crystals varies only within narrow limits and is represented by the following average values:  $^{206}\text{Pb}/^{204}\text{Pb} = 18.57 \pm 0.23$ ,  $^{207}\text{Pb}/^{204}\text{Pb} = 15.74 \pm 0.17$ ,  $^{208}\text{Pb}/^{204}\text{Pb} = 38.44 \pm 0.44$ . These values lie on the anomalous-lead line of Mississippi-Valley type lead-zinc deposits and thereby associate the lead-sulfide occurrences in Ohio with these important deposits. The  $\delta^{34}\text{S}$  values of sulfur-bearing minerals are: celestite =  $+29.0\text{‰}$ , native sulfur =  $+14.2\text{‰}$ , galena =  $-3.4\text{‰}$ , sphalerite =  $-0.9\text{‰}$ , and marcasite =  $-24.2\text{‰}$ . The wide range of enrichment in  $^{32}\text{S}$ , compared to the celestite, can be attributed to isotope fractionation during reduction of sulfate in the rocks. The  $\delta^{13}\text{C}$  values of the dolomite host is  $+1.4\text{‰}$  which is typical of marine carbonates. However,  $\delta^{13}\text{C}$  values of secondary calcites range from  $-1.6\text{‰}$  to  $-21.1\text{‰}$ . The enrichment in  $^{12}\text{C}$  suggests derivation of these carbonates by oxidation of hydrocarbons. The  $\delta^{13}\text{C}$  values of secondary calcites in Ohio may therefore be useful indicators of the presence of hydrocarbons.

9:50

USE OF STRONTIUM ISOTOPES AS INDICATORS OF PROVENANCE OF TILL FROM THE POWELL MORaine, OHIO. Karen S. Taylor and Gunter Faure, Department of Geology and Mineralogy, The Ohio State University, Columbus, Ohio, 43210.

A suite of thirteen till samples, collected along the Powell Moraine between Morrow and Darke Counties, has been analyzed in order to test the effect of provenance on the mineralogical compositions of the samples, and on the concentrations of Rb and Sr and the  $^{87}\text{Sr}/^{86}\text{Sr}$  ratios of their fine-grained silicate fractions. The carbonate concentrations of the less-than-62 micron fractions increase in a westerly direction from 8% at Fulton to 37% at Gettysburg. The abundance of feldspars also increases from east to west, whereas the relative concentrations of illite and other clay minerals decrease in a westerly direction. The concentrations of Sr of the fine-grained non-carbonate fractions increase from 130 to 180 ppm whereas those of Rb decrease from 120 to 90 ppm from east to west. Consequently, the Rb/Sr ratios range from 1.16 to 1.81 and decrease westerly. The  $^{87}\text{Sr}/^{86}\text{Sr}$  ratios are variable (0.725 to 0.740), but correlate positively with the Rb/Sr ratios. The ratio of radiogenic  $^{87}\text{Sr}$  to  $^{87}\text{Rb}$  increases from east to west. These results suggest that the amount of sediment derived from the Superior Province (2.7 billion years) of Canada increases from east to west across Ohio whereas the component that originated from the Grenville Province (1.07 billion years) decreases. The data also indicate that local bedrock sources dominate over sources on the Canadian Precambrian Shield.

10:05

PROVENANCE OF HEAVY MINERAL SUITES OF THE CAMBRIAN-LOWER ORDOVICIAN UNITS OF THE EAST FLANK OF THE BIG HORN MOUNTAINS, WYOMING.

Martha J. Edick  
The College of Wooster  
Wooster, Ohio 44691

Heavy minerals of Cambrian and Lower Ordovician clastic sedimentary rocks along the east flank of the Big Horn Mountains, Wyoming, have been examined. The heavy minerals of the Flathead, Gros Ventre, Gallatin, and Harding Formations are well-rounded and stable, indicating at least a second cycle of erosion of a sandstone or sandy sediment. The Precambrian Sioux Quartzite, composed of reworked sediments and low in heavy minerals, is the most probable source of sediment since the heavy minerals of the rock units under investigation provide no evidence of contribution of sediment from the Precambrian basement rocks in the Black Hills or in the Big Horn Mountains.

Scarcity of abundant heavy minerals indicates a rapid transgression of the sea over the Big Horn Mountain area. This area was of low relief during the time of the Sauk Sequence of Cambrian to Early Ordovician time.

## GEOLOGY

10:15

### THE TECTONIC EVOLUTION OF THE ATLIN TERRANE, NORTHWEST BRITISH COLUMBIA AND SOUTHERN YUKON TERRITORY, CANADA.

Curtis J. Freeman  
The College of Wooster  
Wooster, Ohio 44691

The tectonic history of the Atlin Terrane, British Columbia and Yukon Territory, Canada, is examined to determine the relationship between structures present in and around the Atlin Terrane and the possible tectonic factors apparent at the time of uplift. The data observed is compared to the California Melange area. The stratigraphic and structural settings of both areas are similar lithologically and petrologically. Major fault systems, ultramafic complexes, and sedimentary environments of the Atlin Terrane are shown to be equivalent to those of the California Melange.

Petrologic study of the ultramafic complexes of the Atlin Terrane contain the most important details for tectonic implications because of the restricted environments under which ultramafic rocks form. The ultramafic complexes resemble ophiolite suites and contain serpentized peridotite, gabbro, pillow lava, and radiolarian chert.

The rocks and structures indicate a complex history of plate subduction and collision which culminated in the uplift of the Atlin Terrane during the late Middle Jurassic. This uplift is believed to be the result of collision between the North American plate and the micro-continent Salinia, which forms the present Coast Range Mountains. This collision caused compressional crustal shortening, uplift, and ultramafic emplacement in the Atlin Terrane.

10:40

### THE RELATIONSHIP OF COAL-CLEAT ORIENTATION TO SURFACE-JOINT ANALYSIS IN MUSKINGUM COUNTY, OHIO

EVANS, Scot, Department of Geology,  
Muskingum College, New Concord, Ohio 43762

The widespread occurrence of jointing is a conspicuous feature of the flat-lying to slightly dipping coal-bearing strata of the Appalachian Plateau region of eastern Ohio. Joints in these rocks have long been recognized and used by miners in the planning and layout of coal mines and in the mining of coal beds.

The present study was undertaken to: 1.) describe the physical features of joints and joint sets in coals and associated rocks in the study area, 2.) establish the local joint pattern(s), and 3.) relate the local pattern(s) established by previous workers in order to determine the mode(s) of origin of the joints.

To date, surface joint measurements have been made at 30 localities distributed over eight 7½-minute quadrangles of the study area. Joints in this area are mostly vertical and can be grouped on the basis of parallelism of strike into distinct joint sets that can be traced from outcrop to outcrop. The directional data for each locality were plotted on rose diagrams to demonstrate local trends. The results reveal dominant joint trends of N9°-16°E and N71°-81°W in the coals and trends of N7°-15°E and N68°-79°W in the associated rocks.

10:55

### ABANDONED COAL MINES IN MAHONING & TRUMBULL COUNTIES, OHIO

Ann G. Harris, Youngstown State University, Department of Geology,  
410 Wick Avenue, Youngstown, Ohio 44555

On June 13, 1977 the floor of the garage on Joyce Tanner's property disappeared into a mine shaft that no one knew it was sitting over. Approximately 115 feet of the 232 feet of this mine, abandoned around 1884, had opened up, after being sealed off for over 50 years. One month and two days later a second mine shaft opened up in a matter of minutes in the backyard of Mary Davis's property. Less than a month later a third mine opened up and claimed the bottom of John Cheek's swimming pool. Because of these events and others a survey is being made of all the abandoned coal mines in Mahoning and Trumbull Counties, to ascertain their location, size, type, and probability of opening. As a result of the survey any holes which open and present a danger to people or property will be filled properly and capped so as to prevent the mine opening up again in the future. Changes in zoning laws will not permit any more structures to be built over these abandoned mine entrances.

The mines which have already opened up have either been filled or will be filled shortly as soon as funds are available.

## SUBURBAN LANDSLIDES IN GALLIPOLIS, OHIO.

**11:20** Daniel P. Waltz, Layne-Western Hydrology Division, Mission, KS and Stanley P. Fisher, Department of Geology, Ohio University, Athens, OH.

The City of Gallipolis has allowed construction both above and below the ridge which forms the northern valley wall of the Ohio River. This ridge exhibits prehistoric slump features including: broken rock, crevasses in the soil, hummocky ground, interrupted drainage patterns, drunken forests and other evidence of continuous movement. The stratigraphy includes reddish claystones which have been involved in numerous local slides. Three major slides have occurred during heavy rainfall periods destroying two roads, two foundations and one fire hydrant water main.

The present landforms and drainage problems suggest that the original geomorphology consisted of a knob and ravine type topography. Early construction involved removing the toe of the slope and filling in the ravines. This causes the upland to be less stable and the ravines to be blocked resulting in the pooling of water at the foot of the slope. The housing development along the ridge interrupts the normal drainage causing an inordinate amount of storm runoff to come down the hill in the form of sheetwash adding to the water already pooling at the bottom. This poor drainage and above normal rainfall contributed to the supersaturation of the highly clayey soil resulting in the three major landslides, threatening the stability of the houses on the ridge and dumping unwanted debris in the backyards of downslope residents thereby replacing the toe of the slope removed.

## AFTERNOON SESSION, 1:30 P.M.

Fawcett 101

Vice President, JOHN HILLERUD, Presiding

**1:30** AN INVENTORY OF OHIO CEMETERIES. Studlick, Joseph R.J. and Henning, Roger J., Department of Geology & Mineralogy, The Ohio State University, Columbus, Ohio, 43210

Over 8000 cemeteries are located in Ohio, ranging in size from <0.01 to 285 ha. These cemeteries have a projected lifetime of 65 years at present burial rates, but a shift to cremations may greatly extend the projected lifetime. Concern has been raised that, as with suburban expansion, cemeteries compete for prime agricultural land since they generate more dollars per acre than agriculture.

An inventory is currently being conducted as an aid to geologists and land-use planners for determination of cemetery distribution. Each of Ohio's 807 U.S.G.S. 7½" quadrangle maps are being evaluated for the number, names, sizes, and locations (latitude, longitude) as well as designating each cemetery as urban, suburban, town or rural. In addition, each is analyzed for potential pollution problems on the basis of geology, topography, and location in respect to water supplies.

Preliminary analysis shows great variability exists in number of cemeteries per quad, cemetery size, and areal distribution. The average size is about 1 ha, but the median is near 0.5 ha. The statistical distribution is multimodal for most variables. In general, cemeteries are fewer in number and larger near metropolitan areas and smaller and greater in number in rural areas. The only topographic influence appears to be a tendency for cemeteries to be located on higher ground in rural areas, which are local or regional recharge zones. To date, no cases of water pollution have been reported to governmental agencies in the state, although the problem has been recognized elsewhere.

**1:40** THE REGIONAL GROUND WATER QUALITY IN OHIO: A PRELIMINARY ASSESSMENT. Henning, R.J., Pettyjohn, W.A., and Studlick, J.R.J., Department of Geology and Mineralogy, The Ohio State University, Columbus, Ohio 43210.

The chemical quality of ground water that is used for domestic and municipal drinking supplies is variable across the state, both horizontally and vertically and within similar hydrogeologic units. Throughout most of the state, the quality is good to excellent, but in a few places concentrations exceed drinking water standards. The most highly mineralized ground water used for drinking occurs in the northwestern region, where Ca + Mg, SO<sub>4</sub>, hardness, and dissolved solids concentrations are unusually high.

Ca and Mg concentrations are generally both near 15 mg/l in the east, but increase to 300 and 25 mg/l, respectively, westward. Na + K also increases westward - from 10 to 170 mg/l. Conversely, SO<sub>4</sub> concentrations in excess of 100 mg/l are common in the eastern coal-mining region and generally lower elsewhere. Except for a few small areas, the hardness of ground water in eastern Ohio exceeds 100 mg/l and concentrations are generally in the range of 300-1000 mg/l in limestone areas in the northwestern part of the state. Likewise, dissolved solids usually range from 250 - 500 mg/l but higher concentrations that locally exceed 1000 mg/l occur in the northwest.

## GEOLOGY

2:00

PRESERVATION OF TYPE EXAMPLES OF UNRECLAIMED STRIP-MINED LAND. G.D. McKenzie, Dept. of Geology and Mineralogy, The Ohio State University, Columbus, Ohio 43210

Since about 1965, reclamation laws have been developed or improved for most areas where surface mining occurs in the United States. Some legislation also provides for reclamation of orphaned strip-mined lands -- another positive step toward an improved environment. But it is suggested here that some drastically disturbed landscapes, which have not been reclaimed by man or nature, may actually be of enough recreational or scientific value to warrant leaving them as they are today. For example, many trailbike riders like the freedom of a "wilderness" area, with few regulations or fences and an unusual or challenging terrain. In Ohio, riders may travel several hundred miles to find such an area. Another reason for considering retention of unreclaimed land areas is to study landscape development and vegetational succession in different geologic and climatic areas. To duplicate these outdoor laboratories and their processes would be very expensive. A secondary scientific use might include educational field trips. In some states geomorphic features from the Ice Age have been preserved for educational and historical purposes. Is it unreasonable to retain examples of geomorphic features from the Pre-Environmental Age for similar purposes? The decision to set aside a mined area for non-reclamation by man might depend on intended land use, cost-effectiveness of reclamation if attempted, and environmental and economic effects, off-site, due to the continued presence of the drastically disturbed land. Although it may be many decades before we are close to reclaiming all orphaned strip mines, it may not be too early to undertake study and selection of several type examples for preservation.

### SYMPOSIUM: Environmental Geology in Ohio, 2:15 P.M. JANE L. FORSYTH, Presiding

2:20

GEOLOGICAL ASPECTS OF THE ENVIRONMENT IN SOUTHEASTERN OHIO  
S. P. Fisher, Department of Geology, Ohio University, Athens, Ohio 45701

Many environmental problems of southeastern Ohio occur naturally through no actions of man; they derive from the high-slope topography typical of the region and the resultant deep valleys with their very narrow flood plains. Included here are such problems as a thin relatively infertile soil and poorly cemented bedrocks which lead to siltation of the streams with consequent increase in frequency, rapidity, and magnitude of flooding. The Hocking River is cited as an example. Almost three-quarters of the local landslides occur within only four intervals of soft, slakable reddish claystones. However, in many instances, man has unknowingly chosen to build in localities of prehistoric slides or has unwisely weakened slopes in various ways.

A second group of environmental imbalances stems largely from the acquisition of earth resources. Coal mining has left a heritage of much scarred land and impassable high-walls; the waste piles severely damage our streams with silt and acidic drainage waters. Examples of unsatisfactory land reclamation are given. Effluents of oil-field brines and waste-disposal sites in abandoned alluvial sand pits are local but serious problems caused both by natural infiltration and by runoff permitted through carelessness. Industrial stockpiles of coal and other substances create similar local effluent problems along the Ohio River and a few other streams in the region.

2:45

THE ENVIRONMENTAL GEOLOGY OF SOUTHWESTERN OHIO  
HUFF, Warren D., Department of Geology, University of Cincinnati,  
Cincinnati, OH 45221

Geologic conditions in southwestern Ohio place a number of constraints upon the use and development of land. Of particular concern are problems of slope stability, flooding and drainage, erosion and sedimentation, water quality, solid waste disposal, and, more recently, nuclear power station construction. Upper Ordovician shale and limestone, common throughout the area, is capped by Pleistocene till, outwash sands, and lacustrine clays. Most slope failures can be related to improper excavation and construction practices on these materials. A secondary cause is related to the use of these materials as fill. Erosion and sedimentation in areas of urbanization have resulted in the rapid filling of reservoirs, recreation and flood-control ponds with a consequent overloading of drainage facilities during heavy-runoff periods. Increasing dependence on surface water for domestic supplies has focused attention on water purity while the continuing search for suitable solid-waste disposal sites is hampered by the hazards they pose to existing water wells.



3:10

ENVIRONMENTAL GEOLOGY OF CENTRAL OHIO. G. D. McKenzie, Department of Geology and Mineralogy, The Ohio State University, Columbus, Ohio 43210

Inventory of geologic factors that influence use of the physical environment by the human colony in a 14-county area in central Ohio reveals generally adequate resources and minimum geologic hazards. Aggregate from glacial deposits and carbonate rocks is the principal industrial mineral extracted; sandstone, shale, and clay are also mined. Soils are moderately to highly productive. Fossil fuels are produced in several counties and water power is still used at one site. Although mineralization and low yields are problems in some areas, excellent ground-water supplies from outwash and buried valleys and good supplies from bedrock are available. Surface-water resources have been developed on a large scale for Columbus; however, agriculture and scenic rivers compete for several potential reservoir sites. End moraines, valley slopes, ravines, and the Allegheny escarpment provide topographic diversity to a landscape characterized by flat till plains and are important features in several urban settings and nature preserves. Pollution of water resources is caused by septic tanks, oil-field brines, landfills, and municipal sewage systems. The principal geologic hazard is flooding, both riverine and surface ponding. Other hazards include slumps, erosion, sedimentation, ancient karst, and earthquakes. Resource losses through inappropriate land use can be avoided if comprehensive planning is practiced using sound geologic data. Preservation of choice farmland, water-pollution control, and careful selection of new industry should be encouraged to ensure a quality environment for central Ohio.

3:35

#### ENVIRONMENTAL GEOLOGY OF NORTHEASTERN OHIO

Dr. Jim L. Jackson, Director, Center for Environmental Studies  
The University of Akron, Akron, Ohio 44325

Sedimentation, uplift, erosion, and multiple glaciation have provided a geological setting responsible for variations in weather, logical land-use patterns, and man-made blunders in northeastern Ohio.

Northeastern Ohio is on the divide between Lake Erie and the Ohio River drainage basins. Public Law 92-500 as amended presents difficulties to waste-water treatment plants and industry because waste discharges into small streams along the divide are severely limited.

Wide variations in soils due to variations in glacial drift present special problems to developers and those charged to enforce local zoning regulations.

Strip mining and waste disposal has had some detrimental effects on ground water. Water witches in the area should study glacial geology.

Fractures in the bedrock determine stream patterns in the area. A "fault" at the Perry Nuclear Power Plant site, as reported in newspapers, created some interest in details of local geology.

Careful analysis of remotely sensed data produces interesting possibilities for measuring changes in vegetation and land-use patterns in the new Cuyahoga Valley National Recreation Area.

4:00

#### SHORE EROSION: RATES AND EFFECTS ALONG THE OHIO SHORE OF LAKE ERIE

Charles H. Carter, Ohio Division of Geological Survey, POB 650, Sandusky, Ohio 44870

Long-term recession rates (1876-1973), determined by comparison of maps and aerial photographs, range from less than 0.3 m/yr to more than 3.4 m/yr; the mean is about 0.6 m/yr. Short-term rates (several years), because of superposition of storm waves on a high lake level, can be 4 to 5 times greater. Overall, the rates increase as material differs from rock to till to glaciolacustrine deposits; however, other factors, including beach width, exposure, nearshore slope, and relief can greatly affect the rates. Man-made structures, which armor the shore and/or disrupt the longshore transport of sand, also have significant effects, i.e. increasingly irregular shorelines and increased range of recession rates with time.

Loss of land and soil and subsequent lake sedimentation pose ecological problems: about 10 million tons/yr (long-term average) of fine-grained sediment is derived from the shore of Lake Erie. Adverse effects of erosion and sedimentation might be reduced by beach nourishment, man-made structures, and lake-level regulation.

## GEOLOGY-MEDICAL SCIENCES

4:25

### ENVIRONMENTAL GEOLOGY OF NORTHWEST OHIO

Jane L. Forsyth, Department of Geology, Bowling Green, Ohio 43403

Northwest Ohio is characteristically flat, with a geology of Silurian-Devonian carbonate bedrock overlain by clayey till and local sand ridges. Environmental problems in this area relate to poor drainage on this flat clayey plain, to amounts and quality of water obtained from bedrock or surface supplies, and to flooding and erosion along major streams and the Lake Erie shoreline.

The combination of flat land and clayey impermeable soils creates major surface drainage problems and seriously reduces septic-system efficiency. The quality of surface-water supplies has deteriorated from inflow of domestic, agricultural, and industrial wastes, causing pollution of both surface and ground water, the latter also being affected by leachate from solid-waste disposal in areas of shallow bedrock. Flooding and erosion along both northwest Ohio's low-gradient streams (aided by ice floes) and Lake Erie's shorelines (especially in light of the record high lake levels of recent years) have created problems where damageable structures are present.

Solutions for most environmental problems exist, if enough education, money, and enforced laws are available. Field-drainage systems are adequate if maintained; septic-system backup is eliminated by use of conifers (evapotranspiration) on leach beds; water pollutants from most sources can be reduced if strongly enough encouraged, and education plus enforced zoning can reduce flooding and erosion problems by lake and rivers.

## D. SECTION OF MEDICAL SCIENCES

MORNING SESSION, SATURDAY, APRIL 22, 9:00 A.M.

Med Sci 035

Vice President, RAYMOND GESINSKI, Presiding

9:00

CHANGES IN AVIAN RADII WEIGHT AND LINEAR DIMENSIONS IN RESPONSE TO THERAPEUTIC LEVELS OF TETRACYCLINE. Jeffrey W. Byrnett and John A. Negulesco, Department of Anatomy, College of Medicine, The Ohio State University, Columbus, Ohio, 43210.

Forty Rhode Island Red chicks 19-21 days post hatching (dph) were divided into groups of two and injected on days post-hatching: 21-30 (I); 21-2 (II); 23-4 (III); 25-6 (IV); 27-8 (V); 29-30 (VI) with either 20, 10 or 5mg/kg Tetracycline (tetracycline). Significant changes vs. controls ( $P < .05$ ) were: 1) decreased height of proximal epiphysis, groups II (10 & 5mg/kg) and VI (10 & 5mg/kg); 2) decreased width of proximal epiphysis, groups II (5mg/kg) and VI (20 & 10mg/kg); 3) increased width of proximal epiphysis, group V (10mg/kg); 4) decreased height of distal epiphysis, groups I (20mg/kg) and VI (20 & 10 & 5mg/kg); 5) decreased width of distal epiphysis, group VI (10mg/kg); 6) decreased total bone weight, groups I (20 & 5mg/kg), II (5mg/kg), V (10mg/kg) and VI (10 & 5mg/kg); 7) increased total bone weight, groups III (10mg/kg) and IV (5mg/kg); and 8) decreased overall length, groups I (20 & 10mg/kg), II (5mg/kg), III (20mg/kg), V (5mg/kg) and VI (5mg/kg). In general, bone weight and linear dimensions of growth plates were decreased by treatment of 21-30 dph chicks with therapeutic and sub-therapeutic doses of Tetracycline. Depressant effects, when present, were usually independent of time (dph of chick) or dosage (of Tetracycline).

9:15

OSTEOSYNTHESIS OF AVULSED AVIAN RADII EXPOSED TO +Gz AND ESTRONE TREATMENT.

John A. Negulesco, Department of Anatomy, College of Medicine, The Ohio State University, Columbus, Ohio, 43210.

The effects of stress-factors induced by increased earth gravity states on fracture healing have been inadequately investigated. The present work compares the effects of 2 weeks of exposure to a 2g environment on fracture healing in developing birds. Estrogen, known to promote osteogenesis, was also used to observe if it could ameliorate the stressful conditions induced by the 2g state. Rhode Island Red female chicks subjected to complete fracture of the right radius at 2 weeks post hatching were allowed to heal for 2 weeks at either earth gravity or a 2g environment with saline injected controls and estrone injected experimentals. Five mid-callus serial cross sections of 4-5µm thickness taken from each avulsed radius were processed with H & E and measured with an ocular micrometer. Total fractured bone weight was decreased by exposure to the 2g environment regardless of whether the animal received saline or estrone treatment. The mean weight of fracture callus was significantly decreased when the hypergravity exposed animals received low hormonal levels of 0.2mg estrone. The average mid-cross sectional diameter of fracture callus was significantly decreased when the 2g chicks received saline or 0.2mg estrone and it was increased with the administration of high hormonal levels of 0.4mg to the 2g animal. The mean thickness of the subperiosteal trabeculae of the callus was decreased by exposure to 2g either with or without estrone treatment.

- 9:30** INCIDENCE AND ANATOMICAL VARIATIONS OF THE POSTERIOR COMMUNICATING ARTERY IN CHILDREN. Paulo Fernando Tupam Barboza, D.D.S., Department of Anatomy, Medical College of Ohio, C. S. 10008, Toledo, Ohio 43699.

A series of 100 cadavers of children whose ages ranged from 5 days after birth to 4 years, being 54 males and 46 females, 55 Caucasians and 45 non-Caucasians, was studied to seek the incidence and the anatomical variations of the posterior communicating artery. The following results were obtained. (A) The posterior communicating artery was bilaterally present in 98 cases. In two cases, the left posterior communicating artery was absent. The incidence was statistically independent from side, sex, or ethnic group. (B) The posterior communicating arteries were bilaterally symmetrical in 66 cases and asymmetrical in 34 cases. The symmetrical cases included 36 Caucasians (22 males and 14 females) and 30 non-Caucasians (18 males and 12 females), while the asymmetrical cases included 19 Caucasians (7 males and 12 females) and 15 non-Caucasians (7 males and 8 females). (C) The posterior communicating artery was more frequently large, that is, its diameter was at least half of that of the posterior cerebral artery in 128 arteries (or 78 cases). It was medium in 46 arteries (or 35 cases) and small (or threadlike) in 24 arteries (or 19 cases). (D) The right posterior communicating artery was large in 63 cases, medium in 23 cases, and small in 14 cases. The left was large in 65 cases, medium in 23 cases, and small in 10 cases.

- 9:45** THE INCIDENCE AND VARIATION OF ATRIAL VEINS IN THE HEART OF DOGS. Marie Cole, Liberato J. A. DiDio and Richard A. Yeasting. Department of Anatomy, Medical College of Ohio, C. S. 10008, Toledo, Ohio 43699.

The atrial veins of 40 normal adult dogs were injected, identified, dissected, drawn, and photographed. Their origin, distribution, termination, and arterial relationship were studied on the surface of each atrium. They appeared most frequently on the left atrium, especially in the dorsal lateral third (85% of the cases), and ventral intermediate third (32.5%). Whereas the left dorsal medial third exhibited veins in 25% of the cases, none were present in the ventral medial third. The percentages of cases varied in the right atrium from 5% (ventral intermediate third) to zero (dorsal medial third). In most cases, each vein accompanied an atrial artery. Exceptions were three cases where two veins were satellites of an artery and 16 cases where the veins were isolated. Each vein was named after the third in which it terminated.

- 10:00** CARDIORESPIRATORY RESPONSES TO PROLONGED RUNNING, M.N. Sawka and R.G. Knowlton; VA Center, Physiology Research Lab (552/151), 4100 W. Third, Dayton, OH 45428.

The purpose of this study was to measure the effects of an endogenous heat load on the exercise cardiorespiratory adaptations of 7 runners ( $\dot{V}\text{O}_2 \text{ max} = 66 \text{ ml/kg}$ ). The endogenous heat load was generated by two 80 min bouts of prolonged treadmill running (PTR) ( $70\% \dot{V}\text{O}_2 \text{ max}$ ) spaced by a 90 min rest. Rectal temperature ( $\text{Tr}$ ) was consistently higher ( $P < 0.05$ ) by approx.  $0.6^\circ\text{C}$  during the second PTR with terminal values of  $39.7^\circ\text{C}$  and  $40.3^\circ\text{C}$  respectively. Trend analysis demonstrated that heart rate increased ( $P < 0.05$ ) and stroke volume decreased ( $P < 0.05$ ) during both PTRs. Cardiac output was found to be lower at both 50 min ( $P < 0.05$ ) and 75 min ( $P < 0.10$ ) during the second PTR when compared to the first by dependent  $t$  tests. Neither  $\Delta$  plasma volume, blood lactate,  $\dot{V}\text{E}$  or  $\dot{V}\text{O}_2$  changed significantly during the PTRs. An increased hypocapnia ( $P < 0.05$ ) was measured throughout the second PTR when compared to the first PTR. An increased alkalosis ( $P < 0.10$ ) was also noted at the 80 min measurement of the second PTR. These data demonstrate that  $\dot{Q}$  may be reduced during prolonged running in a ambient ( $23^\circ\text{C}$ ) when  $\text{Tr}$  reaches high levels. It was also concluded that trained runners can maintain normal respiratory and metabolic adaptations to exercise despite the presence of a severe endogenous heat load.

## MEDICAL SCIENCES

### THE DIRECT EFFECTS OF DOBUTAMINE ON THE ISOLATED PERFUSED HEART.

10:15

Jack E. Theaker, Antoinette LaValley, and Philip B. Hollander  
Ohio State University, Col. Med., Dept. Pharmacol., Col's, Ohio 43210

Dobutamine (DB), a recently synthesized catecholamine has been under intensive investigation for several years. Few, if any reports have included study of the direct effects on the isolated heart. Therefore, we undertook this aspect of study in our laboratory. Hearts were removed from male guinea pigs 200 to 325 gms. Hearts were perfused with a Langendorff system by means of a peristaltic pump at 6 ml/min using modified Krebs-Hensleit medium, aerated with 5% CO<sub>2</sub> and 95% O<sub>2</sub>, pH = 7.4 at 30° C. Each heart was equilibrated 45 min; one concentration DB was then introduced and perfused for one hour. Doses ranged from 10<sup>-8</sup> M to 10<sup>-6</sup> M. At doses equal to or greater than 10<sup>-8</sup> M, DB produced positive inotropic responses with no significant chronotropic effect. DB 10<sup>-7</sup> also produced an increase in systolic and diastolic pressures. Typical dose/response, pressure and inotropy, curves were observed. The maximum effect at each concentration was reached within 10 minutes and sustained for the rest of the perfusion time. At no time were arrhythmias noted during DB perfusion.  
(Supported in part by NIH, COHA, and PBH.)

### DIBENAMINE AND THE PRESSOR RESPONSE TO VASOPRESSIN.

10:30

Kenneth M. Hanson and Judith A. Post  
Department of Physiology, College of Medicine, The Ohio State University,  
333 West 10th Avenue, Columbus, Ohio 43210.

It has been variously reported that alpha-adrenergic blocking agents may either enhance, attenuate or have no effect on the vasoconstrictor response to vasopressin. Experiments were performed in anesthetized mongrel dogs. Blood flows in the hepatic artery and in the artery supplying a surgically isolated segment of small intestine were measured with an electromagnetic flowmeter. Arterial perfusion pressures and mean systemic arterial pressure were also recorded. Drugs were administered by intravenous infusion. Gut vascular resistance increased 120% after 10 min vasopressin infusion at a rate of 0.764 U/min. Systemic pressure increased 9%. After Dibenamine (18 mg/kg, i.v.), arterial pressure was decreased by about 34%; however, when vasopressin was then repeated, it rose to the same level reached during the first infusion, reflecting a 65% increase under these conditions. Gut vascular resistance rose to over 200% of control during the second vasopressin infusion. Vasopressin has little constrictor effect on the hepatic artery and, curiously, this appeared to be decreased by Dibenamine. Whatever the mechanisms involved, these results suggest that alpha-adrenergic blockade (Dibenamine) might enhance the portal hypotensive effect of vasopressin and also the accompanying compensatory increase in hepatic artery blood flow without any additional increase in mean systemic arterial pressure.

### MEPERIDINE AND LIDOCAINE METABOLISM IN THE PREGNANT WOMAN AND NEONATE

10:45

Kuhnert, B.R., Kuhnert, P.M., Perinatal Clinical Research Center, Case Western Reserve University, 3395 Scranton Road, Cleveland, Ohio 44109

Meperidine and lidocaine are commonly used to provide pain relief during labor and delivery: Meperidine is administered I.V. during labor and lidocaine is administered locally at delivery. Both of these drugs, which can be metabolized to active compounds, can easily cross the placenta and reach the fetus within minutes. However, metabolism of these drugs has not been well studied since the availability of modern, sensitive analytical techniques such as gas chromatography (GC) and mass spectrometry (MS). The purpose of this study was to use GC-MS techniques to determine the levels of meperidine, lidocaine, and their active metabolites - normeperidine and monoethylglycinexylidide (MEGX) - in the plasma of obstetrical patients during labor, in cord blood at delivery, and in neonatal urine for three days postpartum. The data indicate that measurable amounts of the metabolite, normeperidine, as well as meperidine and lidocaine, reach the fetus. Fetal exposure to meperidine was highest 2-3 hours after maternal medication whereas fetal exposure to normeperidine was highest after 4 hours. Meperidine, lidocaine, and their metabolites were found in neonatal urine for the three day study period. The results of this study support clinical observations of more frequent adverse drug effects on neonates born 2-3 hours following meperidine administration. In addition, the results show that the neonate receives more lidocaine following pudendal anesthesia at delivery than is generally realized.

- 11:00** EFFECTS OF VARIATIONS IN MALE COPULATORY BEHAVIOR ON SUCCESSFUL REPRODUCTION DURING POSTPARTUM MATING IN NORWAY RATS. James R. Connor, Jr. and Harry N. Davis, Jr., Departments of Psychology and Physiology, Wright State University, Dayton, Ohio 45435

During mating, male rats typically complete approximately seven ejaculatory series (i.e. the copulatory activity leading up to and including one ejaculation) prior to sexual exhaustion. The functional significance of these multiple series has long puzzled reproductive biologists since females mated during the 4-day estrous cycle appear to require only one such series to ensure successful reproduction. At the same time, however, much research suggests that female rats in the wild do not ordinarily mate and conceive during a 4-day estrous cycle, but rather during a brief period of estrus postpartum, usually within the first 24 hours following parturition. The present study investigated whether the male's multiple series might somehow promote successful reproduction during a postpartum mating, even though they do not appear to do so when mating occurs during the 4-day cycle. Results indicated that, in postpartum mating, multiple ejaculatory series may be critical for successful conception.

- 11:15** INTERACTION OF MEDICINE AND ENGINEERING IN EGYPT  
Herman R. Weed, Director, The Ohio State University,  
Bio-Medical Engineering Center, 2015 Neil Ave., Col., OH 43210

Egypt, as a developing third world country, has a special need for Bio-Medical Engineering, the practical interaction of medicine and engineering. Through grants from the industrialized world, Egypt has received millions of dollars worth of sophisticated clinical and research technology. The need for such equipment for a realistic health care program is great. However, the need for trained personnel to operate, adapt, maintain, and specify the technology in the particular theater of Egypt is equally vital. This need requires the cooperative interaction of physicians and engineers in general, and in particular the medical and engineering faculties of the Egyptian universities where training programs must initiate.

Supported in part by U.S. funds, the University of Cairo has initiated a BME program emphasizing the practical aspects of medical instrumentation specification, maintenance, adaptation, and operation. The program is centered on individual year-long student projects on a one-to-one basis between engineers and a specific hospital need area such as dialysis or intensive care. Emphasis is on proper selection, application, and operation of the appropriate technology. While resulting in immediate improvement in equipment function and dependability, the side effects include cooperation of the engineering and medical faculty, the development of a meaningful educational program, and thus the capability of the University to provide ongoing training for future needs.

**11:30 A.M. BUSINESS MEETING**

**AFTERNOON SESSION, 1:30 P.M.**  
**Med Sci 035**  
**Vice President, RAYMOND GESINSKI, Presiding**

- 1:30** THE EFFECT OF VITAMIN E ON ALCOHOL-INDUCED LIVER INJURY IN RATS. T. E. Stege and W. H. Staples, Department of Zoology, Ohio Wesleyan University, Delaware, OH 43015

Although the cause of ethanol-induced liver injury is not clearly understood, one theory proposes that the metabolism of ethanol causes injury to the liver via lipid peroxidation. Since antioxidants such as Vitamin E appear to be effective inhibitors of lipid peroxidation, the effect of Vitamin E on ethanol-induced liver injury was investigated. Rats were maintained for four weeks on an antioxidant-free liquid ethanol (35% of calories) diet (Lieber/Decarli Diet, Bio-Serv Inc.) fortified with Vitamin E (250 i.u. DL-a-Tocopherol/L Diet). Animals were subsequently evaluated for ethanol-induced liver injury by assessment of plasma Glutamic Pyruvic Transaminase (GPT) and liver triglyceride levels. Values from rats maintained on ethanol + Vitamin E did not differ significantly in either plasma GPT levels ( $26 \pm 4$  sf units/ml vs.  $28 \pm 4$  sf units/ml) or liver triglyceride levels ( $4.6 \pm 0.9$  mg/g vs.  $6.8 \pm 1.1$  mg/g). Both groups of ethanol treated rats did have significantly higher plasma GPT and liver triglyceride levels over their sucrose controls. Since no significant difference was demonstrated between rats on the standard ethanol diet and the rats on the ethanol diet fortified by Vitamin E, our results indicate that Vitamin E is not an effective inhibitor of ethanol-induced liver injury.

## MEDICAL SCIENCES

- 1:45** A TRIAL OF COMBINED MEGAVITAMINS IN TREATING CHILDHOOD HYPERKINESIS.  
John W. Cromer, Jr. and H. Ira Fritz, Department of Biological Chemistry,  
School of Medicine, Wright State University, Dayton, Ohio 45435.

Large pharmacologic doses of vitamins ("megavitamins"), singly or in combination, have been reported by some investigators as efficacious in the treatment of hyperkinesis. With the exception of studies using only pyridoxine, all such reports have lacked a controlled setting and unbiased methodology. In our study, 12 pre-adolescent children diagnosed as hyperkinetic by predetermined criteria were assigned randomly to one of two groups. Each group was treated with both a control vitamin formulation and a combined water-soluble megavitamin formulation over a 12-week period. The study employed double-blind methodology and crossover occurred at six weeks. All children were placed on a modified Feingold diet prior to medication and maintained the diet throughout the study. The children were evaluated at 3-week intervals utilizing parent and teacher questionnaires, a ranking scale for neurologic soft signs, an objective measure of reaction time and attention span, and various clinical chemistry parameters including whole blood serotonin levels. The findings indicated possible benefit to some of the children receiving the megavitamin formulation and, interestingly, apparent behavioral worsening in others while on the megavitamins.

- 2:00** RADIOIMMUNOASSAY OF PROSTAGLANDIN F2a AND ITS MAIN CIRCULATING METABOLITE  
Morris Seal, MT(ASCP), Jon Rahman, MD & W. William Spencer, PhD  
St. Elizabeth Medical Center  
601 Miami Blvd. West  
Dayton, Ohio 45408

The evaluation of two commercially available radioimmunoassay kits for the determination of human endogenous plasma prostaglandin F2a and a primary metabolite 13,14-dihydro-15-keto-prostaglandin F2a is described. These highly sensitive radioimmunoassay procedures are based on the method of Jaffe and Levine and are manufactured by Clinical Assays, Inc. Cambridge, Massachusetts. Separation of antibody-bound prostaglandin and free prostaglandin is achieved by precipitation with a second antibody. To eliminate plasma protein interference, purification steps included a methylal:alcohol extraction followed by dialysis using a Karush-type chamber prior to assay. Findings regarding venous normal ranges, specimen stability, specificity of antiserum, as well as accuracy, sensitivity and precision of the assay procedure will be cited. Additionally, a basic review of prostaglandin structure and biochemistry together with possible applications of prostaglandin measurement in clinical medicine are to be briefly discussed.

- 2:15** IMMUNOMODULATORY EFFECTS BY BOVINE SERUM ALBUMIN. John W. Oldfather, Frank W. Chorpennig, and Harold R. Cooper. The Ohio State University, Columbus, Ohio 43210.

During studies of splenocyte stimulation by teichoic acid (TA), crystalline bovine serum albumin (BSA) was used as a control. It was found that stimulation of BSA-primed animals by TA was suppressed. Spleen cells of S-D rats, injected i.v. with 5 mg BSA 10-15 wk pre-sacrifice, were cultured (RPMI 1640, 5% CO<sub>2</sub>, 37°C) in the presence of 10 µg TA for 2-7 days. Scintillation counts of <sup>3</sup>H-TdR uptake indicated significant suppression (p < 0.02) of TA stimulation in the BSA-primed rats compared to rising kinetic curves in unprimed controls. Stimulation by pokeweed mitogen and lipopolysaccharide (LPS) did not appear to be suppressed. The percentage of cells undergoing blastogenesis showed a similar pattern, confirming the findings. In other experiments, BSA was injected i.v. into Swiss mice on days 2, 1 and 0 before injection of sheep red cells (Srbc) and the splenic hemolytic plaque-forming cells (PFC) were counted 4 days after giving Srbc. In Srbc-primed mice, PFC were enhanced (P < 0.001), while in unprimed mice they were suppressed (p < 0.01). BSA or a contaminant had modulatory effects on the Srbc response and on stimulation by TA. Limulus lysate tests of the BSA showed less than 1 ng/ml of contaminating LPS, which appears to be insufficient for modulation. These findings raise questions regarding possible involvement of antigenic competition or synergistic effects by the minute amount of LPS.

- 2:30 IN VITRO ASSAY OF IMMUNOMODULATORY EFFECTS BY TEICHOIC ACID. J.J. Lynch, Jr. and F.W. Chorprenning. The Ohio State University, Columbus, Ohio 43210.

Studies in vivo have shown that lipid-free teichoic acid (TA) modulates responses to sheep red cells (Srbc). However, such tests require large amounts of TA, present problems due to individual variation, and do not permit identification of the effective cell populations. In vitro experiments are described in which we have demonstrated enhancement of Srbc responses in mice using small amounts of TA and pooled syngeneic spleen cells. Cultures of C3H/HeJ splenocytes ( $2 \times 10^7$  cells) were prepared in 1.0 ml of Click's nutritional medium contained in a 2-chambered glass (Marbrook) container separated by a dialysis membrane. The culture was placed in one chamber to which  $3 \times 10^6$  Srbc and 0.5  $\mu$ g TA were immediately added. The other chamber contained 9.0 ml of additional nutritional medium. Incubation was carried out at 37°C under 5% CO<sub>2</sub> for 4 days, and the response to Srbc was measured by the hemolytic plaque test. Splenocytes responded to Srbc in vitro, exhibiting a significant increase in numbers of Srbc hemolytic plaque-forming cells (PFC) over background counts. Cultures to which TA had been added showed a further significant ( $p \leq 0.01$ ) increase in numbers of PFC of Srbc specificity. PFC of TA specificity were suppressed. This work demonstrates the feasibility of testing the modulatory effects of TA in vitro, conserves TA, and shows that splenocytes alone are competent for induction of modulation.

- 2:45 EFFECT OF MACROPHAGES ON IN VITRO IgM AND IgG ANTIBODY PRODUCTION. Joseph P. Dalmasso and Matthew C. Dodd. Ohio State University, 484 W. 12th Ave., Columbus, Ohio 43210

Splenic lymphocytes from mice undergoing an IgM or IgG response to sheep erythrocytes (Srbc's) exhibit two different responses when cultured 4-6 days in vitro. In the absence of antigen (Srbc's) the antibody response diminishes with time. With antigen present in culture, there is an increase in the number of Jerne plaque forming cells (PFC's) which exceeds the original response observed. IgM producing lymphocytes, when cultured with antigen and peritoneal macrophages from an allogenic tumor bearing animal (tumor macrophages) show no change from control numbers of PFC's. However, the effect of tumor macrophages on the PFC response of cultured IgG producing cells is quite different, as lymphocytes show a suppressed PFC response in the presence of homologous antigen and tumor macrophages. Culturing of either lymphocyte type with macrophages without antigen results in an accelerated decline in the number of PFC's. Mice with progressing fibrosarcoma show a greatly decreased ability to respond to Srbc's. As some investigators feel the tumor state may reflect an inability of the animal to mount a normal primary and/or secondary immune response, these data may lend insight into the apparently different roles played by the tumor macrophage in affecting the primary and secondary humoral responses.

- 3:00 EXTRACELLULAR CALCIUM CONTENT OF SINGLE STRIATED MUSCLE FIBERS. Donald Wise, Barry Lindley, and Albert Kirby. College of Wooster, Wooster, Ohio (44691); Case Western Reserve University, Cleveland, Ohio (44106).

Three components have been described which contain Ca<sup>2+</sup> in striated muscle: the sarcoplasmic reticulum, mitochondria, and the surface of the fibers (extracellular space). Ca<sup>2+</sup> capacity of the surface of the fibers is difficult to measure because the ions are loosely held. Cardiac fibers are dependent on extracellular Ca<sup>2+</sup>, but its importance to striated fibers is not known. An apparatus was developed which measures the surface Ca<sup>2+</sup> of single fibers by the exchange of <sup>45</sup>Ca<sup>2+</sup> in the surface pool. The time constant of that pool is ca. 20 sec. and its capacity is ca. 4 mmol/Kg fiber. The pool may reside in the tubules of the sarcolemma.

## MEDICAL SCIENCES

- 3:15** HYPEROSMOTIC CHANGES IN  $H^+$  SECRETION,  $Na^+$  ABSORPTION AND GLUCOSE OXIDATION OF ISOLATED RAT GASTRIC MUCOSA. T.J. Sernka and R.E. Rollin. Dept. Physiology, Wright State Univ. Sch. Med., Dayton, OH 45435.

Since many consumed foods and drinks are appreciably hyperosmotic to body fluids, changes in the basic functions of the stomach were sought. Effects of 4-fold hyperosmotic sugar solutions on gastric mucosal transport and metabolism were determined in this study. Rat gastric mucosa was isolated and 1) mounted in flux chambers for measurement of ion transport or 2) incubated for measurement of tissue oxidation. In isosmotic Ringer solution, the chambered gastric mucosa secreted  $H^+$  and absorbed  $Na^+$  against their respective electrochemical gradients. Replacement of the luminal solution with Ringer solution made 4-fold hyperosmotic with dextrose abolished  $H^+$  secretion and  $Na^+$  absorption within 20 min. The spontaneous electrical potential difference fell simultaneously to zero. In isosmotic Ringer solution, the incubated gastric mucosa oxidized glucose to carbon dioxide. Replacement of the incubation medium with Ringer solution made 4-fold hyperosmotic with sorbitol reduced glucose oxidation by more than 80%. These studies show that even moderately concentrated sugar solutions inhibit active ion transport and mucosal respiration in the stomach. (Supported by USPHS, NIAAA Grant 7 ROI AA 03210-01, -02.)

- 3:30** THE IN VITRO EFFECT OF ASCORBIC ACID AND BETAINE HYDRATE, ALONE, AND IN COMBINATION, ON NORMAL AND MALIGNANT CELLS. J. F. Freidel, J. C. Fardon, Y. Tsuchiya and L. G. Nutini. St. Thomas Institute, 1842 Madison Road, Cincinnati, Ohio 45206

Two tumors, the Ehrlich carcinoma and the L 1210 leukemia, and one normal cell line, the STI fibroblast, were used in these experiments. All cells were cultured in Falcon flasks, the tumor cells being taken from mice bearing the respective tumors in the ascites form and the normal cells from a line grown continuously *in vitro*. The D-isoascorbic acid and betaine hydrate were added directly to the cells in Falcon flasks. These were added alone and in combination, at a number of different dosages. Effects were determined on the basis of difference in the mitotic count of the cells before treatment and 6 hours after treatment, the % decrease indicating the degree of effectiveness. The results indicated that both D-isoascorbic acid and betaine hydrate had some effect on reducing the mitotic count of both types of tumor cells, but that the dose required for this reduction was greater than when the two were used in combination. The mitotic activity of normal STI fibroblasts was not inhibited at the same dosages of D-isoascorbic acid and betaine used for tumor cells but were affected at larger doses. The mode of action of these materials is thought to be at the surface membrane level and will be discussed.

- 3:45** CYCLIC NUCLEOTIDE LEVELS IN HUMAN MAMMARY TUMORS AND BENIGN LESIONS. M.K. Foecking, J.P. Minton and R.H. Matthews, Dept. of Physiological Chemistry, Ohio State University, Columbus, Ohio 43210.

An understanding of the cause of the uncontrolled growth seen in cancerous tissue is basic to discerning the cause of cancer. Benign mammary disease exhibits a degree of uncontrolled growth. If the mechanism of the loss of growth control in benign disease is understood, it may provide a basis for the understanding of the uncontrolled growth seen in cancer. Previous studies have shown that in human mammary carcinoma, adenosine 3':5' cyclic monophosphate (cAMP) levels are increased in comparison to normal breast tissue. Cyclic AMP is active as a second messenger in hormone action, and may also play a role in growth control. We therefore undertook to measure cyclic nucleotide levels in benign and neoplastic tissue specimens obtained from biopsy at The Ohio State University Hospitals. Cyclic nucleotide levels were determined by radioimmunoassay. Our results verify the finding that cAMP levels are raised in mammary carcinoma. In addition, we have shown that benign breast disease has intermediate levels of cAMP, almost twice the level of normal breast tissue, whereas mammary cancer has levels 6 times as high as normal breast tissue. When expressed as picomoles cAMP per mg of protein (mean  $\pm$  S.E.), the average values were: normal tissue  $4.92 \pm 0.85$ , fibrocystic disease  $9.97 \pm 1.44$  and carcinoma  $33.68 \pm 6.82$ . The levels of guanosine 3':5' cyclic monophosphate follow a similar progression ranging from  $0.15 \pm 0.04$  in normal tissue to  $1.18 \pm 0.72$  in carcinoma. How increased levels of cAMP support the rapid growth rate of neoplastic cells or whether the increased levels seen are an effect and not a cause remains to be proved.



- 4:00** COMPUTER PROCESSING OF ELECTROCARDIOGRAPHIC SIGNALS. Subhash C. Kwatra, Visiting Assistant Professor of Electrical Engineering, The University of Toledo, Toledo, Ohio 43606.

A new method of obtaining the human electrocardiogram is presented in this paper. The resulting ECG signals are processed by a mini-computer such that they can be used by a physician for prognosis and diagnosis. The method uses a composite conductive medium formed by the patient's body and the external liquid medium such as bathwater in a bathtub.

ECG signals are picked up by silver disc electrodes embedded on the inside surface of the bathtub. They are amplified and filtered by electronic circuitry designed for the purpose. Now, from the basic concepts of electromagnetic theory it is known that these signals must be projections of the heart dipole vector, except for any distortion produced by the instrumentation. Compensation for the magnitude and phase distortion is provided, and extraction of the X, Y and Z (orthogonal) leads is performed. A comparison of orthogonal leads thus obtained with similar leads from a Hewlett Packard 1520A Vectorcardiograph is given for 5 subjects. The average error is found to be 12.6%. Two of the advantages envisioned for the procedure are: (1) Since electrodes are not required to be placed on the body surface, the technique can be used effectively for patients with severe burns in a Hubbard tank; and (2) This technique can be used remotely in a patient's home because he does not require any technical assistance; the resulting ECG can of course be transmitted to his physician's clinic over an ordinary telephone line. The cost of the bathtub ECG electronics is estimated at \$200.

- 4:15** ACCOUSTICAL DIAGNOSIS OF SURGICALLY-INDUCED ARTHRITIC DAMAGE — AN ANIMAL MODEL

Charles L. Robinson, Jr.  
Department of Biology  
University of Akron  
Akron, Ohio 44325

An arthritic condition, degenerative joint disease, was surgically induced in rabbits by performing partial and complete meniscectomies. The progression of the disease was followed accoustically through the use of a new filtering technique and a piezoelectric transducer. Resulting power spectrums indicate a possible correlation between the noise produced by the arthritic joint and the severity of the disease.

- 4:30** ABSOLUTE MEASUREMENT OF THE FUNDAMENTAL CHARACTERISTICS OF ULTRASONIC FIELDS  
Michael O'Shea, Bio-Medical Engineering Center,  
The Ohio State University, 2015 Neil Avenue, Columbus, Ohio 43210

This paper describes a method of measuring several important parameters of an ultrasonic field. The technique enables the measurement of the characteristics of both pulsed and continuous wave ultrasonic fields, and is well suited for operation in the frequency range of most existing medical devices (1-10 MHz). The method involves the calibration of small piezoelectric microphones. These calibrated microphones enable the absolute measurement of several fundamental quantities of the ultrasonic field, including the peak acoustic intensity, the peak energy density and the average power.

In this investigation, the absolute intensity of an ultrasonic field is determined by employing a sensitive balance to measure the force produced as a result of the radiation pressure. The ultrasonic microphone is then placed in the known field and the relationship between intensity and microphone voltage output is obtained. Emphasis is placed on the problems that are encountered in the instrumentation. Several factors including the elimination of acoustic streaming and construction of nearly perfect ultrasound reflectors are discussed.

The small size of the microphones (1 mm x 1 mm) make them very useful for measuring the characteristics of the narrow beam ultrasonic fields normally encountered in medical use. For instance, they can be mounted on the end of a catheter and used to make in vivo measurements.

## MEDICAL SCIENCES — PHYSICS & ASTRONOMY

- 4:45** PROBLEMS IN ASSESSING THE SAFETY OF DIAGNOSTIC ULTRASOUND  
David A. Rice, Herman R. Weed, and L. A. Swiger  
Bio-Medical Engineering Center, The Ohio State University,  
2015 Neil Avenue, Columbus, Ohio 43210

The rapidly increasing use of diagnostic ultrasound mandates the establishment of its limits of safety. Entities such as X-radiation were considered safe until significant human suffering emphasized their damage potential. An interdisciplinary group is doing pilot work NSF Grant APR77-11665, "Assessment of Biological Risk of Ultrasound Irradiation," to find some of the risks of using diagnostic ultrasound. The study is determining the exposures resulting from clinical use of ultrasound and assessing the hazard of these exposures. This paper will describe some of the problems of safety assessment and an approach to solving them.

The dose received by a patient depends upon many variables including characteristics of the equipment itself, the operator, and the patient. The group is currently establishing calibration standards, including the development of an ultrasound sensor on a catheter which can be placed within the body to measure exposure at selected sites. To assess the hazards of diagnostic exposure an epidemiological study sensitive to teratological and genetic effects is planned using swine. Preliminary analysis on 4000 litters, some exposed to diagnostic ultrasound, indicates that exposure results in no deleterious effects.

- 5:00** CLINICAL USE AND EVALUATION OF A  
VISUAL VOCODER AS A TEACHING AID FOR THE DEAF  
Richard M. Campbell, Brian K. Cosens, and Herman R. Weed  
The Ohio State University Bio-Medical Engineering Center  
and Department of Electrical Engineering, 2015 Neil Avenue,  
Columbus, Ohio 43210

A visual speech vocoder designed and constructed at The Ohio State University has been used in the home to improve the speech of a middle-aged deaf woman who has never had any previous formal speech training. The vocoder has been available to the woman in her home so that she could work with it to improve her speech between the once a week visit of the speech therapist. The therapist worked with the subject with the aid of the vocoder and the deaf subject used the vocoder by herself about 15 to 30 minutes per day. The therapist recorded all of the sounds for each session so that they would be available for use on the vocoder when she was not present. In this manner, a great deal of utilization of both the vocoder and the therapist was achieved. The initial understanding of the speech as judged by a group of listeners as a standard passage was read was about ten percent. After three months of work with the vocoder and the therapist, the understanding was judged to be better than fifty percent.

## E. SECTION OF PHYSICS & ASTRONOMY

MORNING SESSION, SATURDAY, APRIL 22, 9:00 A.M.

Fawcett 112

Vice President, VINCENT L. DONLAN, Presiding

- 9:00** COOLING BY IMERSION IN LIQUID NITROGEN. Thomas Boshinski, Fritz Knese, and Thomas W. Listerman. Wright State University, Dayton, Ohio 45431.

"Say Prof, did you see that? When you dunked that steel bolt into the liquid nitrogen the liquid started boiling violently. Then the boiling started gradually dying down until it looked like it was just about to stop. But instead of stopping, there was a big burst of bubbles and then the boiling stopped completely. Why did that happen, huh Prof?"

Most people seem fascinated by this phenomenon yet relatively few, even among those with significant liquid nitrogen experience, seem able to explain it. The explanation lies in the nature of heat transfer from a solid to a liquid. Specifically, the sudden increase in boiling is due to a change from film boiling to the more efficient nucleate boiling heat transfer mechanism.

We have developed two variations of an intermediate level undergraduate laboratory experiment to measure the heat transfer rate after the sample is immersed in liquid nitrogen. The temperature of the sample, as measured by a thermocouple, is recorded as a function of time using either a potentiometer-strip chart recorder or a digital voltmeter-minicomputer combination. The heat transfer rate as a function of sample temperature is computed from these results and the reason for the effect is clearly seen.

- 9:20 THE DEVELOPMENT OF A VERY LOW COST, HIGH PERFORMANCE, FLAT PLATE SOLAR ENERGY COLLECTOR. Donald P. Greider 7213 Ridge Road Mechanicsburg, Ohio 43044

Many studies have been made illustrating the fact that production of moderate performance solar energy collectors at a reasonable price such as five dollars per square foot before installation, would rapidly cause an energy revolution by making solar energy the most economical energy source for space heating and cooling and also for a large portion of commercial and industrial energy needs. It is obvious that many social and educational barriers will remain to the widespread use of solar energy even when such a price-performance obstacle as the above stated one has been overcome. In hope that our energy future will be a good one, a very high performance flat plate solar energy collector has been developed which more than meets the requirements. This collector system uses copper tube for the fluid carrying channels and steel fins as the major absorber surface. With a black chrome selective surface and Teflon internal glazing, this collector is capable of performance equalling some of the best collectors available and exceeding many while maintaining a cost of well below five dollars a square foot including installation.

- 9:40 LABORATORY EXPERIMENTS USING THE KIM-1 MICROCOMPUTER MODULE. Klaus Fritsch, Physics Department, John Carroll University, Cleveland, Ohio 44118.

A number of experiments will be described which were designed to acquaint students with practical applications of a microprocessor in a laboratory environment. These experiments involve the design of hardware, interfacing to the KIM-1 board (MOS TECHNOLOGY 6502 Microprocessor) and the development of the required software in machine language and in BASIC. Examples of experiments to be discussed are the automatic measurement of the capacitance of capacitors producing a printout of the capacitance values and the control of a videocassette recorder for automated playback of videotape selections.

- 10:00 DYNAMIC FRICTION LIMITATIONS FOR ION BEAM DIAGNOSTICS OF MAGNETIZED PLASMA; Garry L. Johnson, Merrill L. Andrews, and John S. Martin; Department of Physics, Wright State University, Dayton, Ohio 45435

Increasingly severe energy shortages due to the depletion of fossil fuels require the investigation of alternative sources such as controlled thermonuclear fusion. A comprehensive determination of plasma characteristics is necessary for the development of efficient containment configurations of fusion plasmas. One very capable diagnostic technique is the Ion Beam Probe which can measure local plasma parameters such as electron density,  $n_e$  ( $10^{11} \sim 10^{16} \text{ e}^-/\text{cc}$ ); electron temperature,  $T_e$  ( $5 \sim T_e \sim 1000 \text{ eV}$ ); and plasma electrostatic potential,  $\phi_p$  ( $1 \sim \phi_p \sim 200 \text{ volts}$ ). A singly charged alkali ion beam accelerated by an electrostatic gun to several kilovolts traverses the magnetized plasma in a curved trajectory perpendicular to the flux lines. A fraction of these primary beam ions undergo negligible momentum transfer collisions with hot plasma electrons which strip off an additional electron. This doubly ionized secondary beam separates from the primary due to the magnetic field. The primary and secondary beam currents for two types of alkali ions are measured to determine  $n_e$  and  $T_e$ . The change in kinetic energy of the beam as analyzed by an electrostatic detector indicates  $\phi_p$  at the point of the doubly ionizing collision. In addition to the electron collisions the beam ions also collide with plasma ions. Although the ion-ion cross-section is smaller there is a resulting dynamical friction that causes an energy loss in the beam limiting the region of applicability of this diagnostic for  $\phi_p$  measurements. A test particle model is used to calculate the energy loss and for the higher density, lower temperature regime this effect is important.

## PHYSICS & ASTRONOMY — GEOGRAPHY

10:15

### A COMPARISON OF TWO DIFFERENTLY SLOPED BACKGROUNDS IN RELATION TO A STATIONARY OWENS-ILLINOIS SUNPAK SOLAR ENERGY COLLECTOR

Bradley Fintel, P. O. Box 243, Hamler, Ohio 43524

The purpose of this experiment was to determine an optimum performance condition of a solar energy collector by varying the reflective background angle. The two angles chosen for the comparison were  $30^{\circ}$  and  $45^{\circ}$ . Throughout the experiment, several settings were made on a heater that would pre-heat the intake air to the collector, thus insuring an accurate performance value. The tube's various internal temperatures for each day were displayed on a multipoint temperature recorder along with the insolation quantities. After collecting data for approximately eight hours every day, those values were converted to a single point on a graph. This showed that the useful energy output divided by an insolation quantity was proportional to an inlet minus ambient temperature value divided by the insolation quantity. After compiling the data, it was evident that the  $45^{\circ}$  angle background data contained a higher peak efficiency value than the  $30^{\circ}$  angle background data. Consequently, the line drawn to represent the performance of the  $30^{\circ}$  angle background maintained a more minimal slope over the wide range of inlet temperatures. To insure maximum performance of the solar collector, it was concluded that a  $45^{\circ}$  angle background should be used only when the ambient and inlet temperatures are within  $10^{\circ}$  of each other.

10:35 A.M. BUSINESS MEETING

## F. SECTION OF GEOGRAPHY

FIRST MORNING SESSION, SATURDAY, APRIL 22, 9:00 A.M.

Millett 157

Membership Chairman, DAVID RIETH, Presiding

9:00

THE IMPACT OF TORNADO ON RETAIL SALES AND SHOPPING PATTERN OF XENIA RESIDENTS: A STUDY IN MARKETING GEOGRAPHY. Om Dikshit and K. R. Julu, Central State University, Wilberforce, Ohio 45384

This paper describes and analyzes the impact of tornado of April 3, 1974 on retailing operations and shopping pattern of Xenia residents. Xenia, so-called the city of hospitality, has survived the devastating tornado and has begun to rebuild, thus making everything seem to be coming to normalcy. But the normalcy of business operations and Xenia's huge success and growth in business trends cannot necessarily be attributed to the impact of the tornado. There may be one or more other causes that might have led to the growth of business operations. Therefore, an attempt has been made in this study to measure those causes that enabled the Xenia business operations to flourish. The authors of this paper have endeavored to bring the facts into consideration through various tables, maps, charts, and so forth, in order that there will be a chronological understanding of the events that took place since the tornado. The influence of various factors that led to the higher sales, frequency of visits to business areas, and market penetration and share of market have been discussed to a large extent.

9:15

AN ANALYSIS OF LAND VALUE VARIATIONS IN MADRAS CITY, INDIA, 1971. G. Venugopal, Ashok K. Dutt and Allen G. Noble, Department of Geography, The University of Akron, Akron, Ohio 44325

While it has been widely recognized that urban land values vary from point to point in urban areas, few studies have been made of non-western cities to determine the extent of the variation and its geographic pattern. This paper analyzes the spatial distribution of land value in Madras, India in 1971. The study also investigates the reasons for such variations and attempts to compare the pattern of Madras with that of western cities.

Utilizing a distance decay technique, three separate areas of high land value are identified, of which the most important is the central business district, centered on Parry's Corner. The other two, Thyagaraya Nagar and Middle Mount Road are newer commercial areas.

The rationale for the variations in land value is explained by examining some important factors such as percentage of commercial, industrial and residential land use through factor analysis. The role played by major highways and suburban railways in extending residential land values is also analyzed.

**9:30** ASSESSING LANDSAT IMAGERY IN THE DETECTION OF CENTRAL PLACES IN OHIO. Vern Harnapp, Department of Geography, University of Akron, Akron, Ohio 44325

In recent years Landsat imagery has been used in a variety of ways to investigate topics ranging from mapping land use changes to detecting oil spills. The urban setting, meanwhile, has not escaped the "eye" of the satellite. The changing urban fringe has come under close scrutiny as has the possibility of detecting urban centers from space. It has been proposed that central places as small as 5,000 population can be detected via Landsat imagery. This latter hypothesis was tested for the state of Ohio using imagery taken from April, 1972 through June, 1974 and utilizing non-automated interpretation techniques.

**9:45**

CONSUMER TRAVEL PATTERNS IN A SMALL SOUTHERN TOWN

Peter A. Doherty  
Department of Geography  
Wright State University  
Dayton, Ohio 45435

This study examines the influence of life cycle stage, ethnic status, and social class on the travel patterns of consumers in Athens, Georgia. Using three pairs of consumer groups, differences in perceived travel time, number of stores visited, frequency of visits per year, and type of stores chosen are examined. The first pair of consumer groups differ with respect to life cycle stage, the second with respect to ethnic status, and the third by social class. Stage in the life cycle accounted for differences in perceived travel time and the number of stores visited; ethnic status accounted for differences in the number of stores visited and the type of store; and social class accounted for differences in perceived travel time, frequency of visits, and types of store chosen. Reasons for such differences are discussed utilizing responses by the consumers, and findings of related research projects.

**10:00**

THE ORIGINS AND CHARACTERISTICS OF FOREIGN IMMIGRANT SETTLING IN TOLEDO AND NORTHWESTERN OHIO, 1965-76. Alvar W. Carlson, Department of Geography, Bowling Green State University, Bowling Green, Ohio 43403.

The character of foreign immigration to the United States has changed significantly since the passage of the 1965 Immigration and Nationality Amendments. More immigrants are coming from Asia and Latin America and fewer immigrants from Europe. Regardless of their origins, most of the recent immigrants settle in urban, especially metropolitan, areas.

This study analyzes the origins, characteristics and settling of those immigrants who located in Toledo, by zip code area, its suburbs and elsewhere in northwestern Ohio. The locations of their settlements were compared to the distribution, by census tract, of the Black and Spanish-speaking populations and median family income. An analysis of naturalization petitions can provide valuable data on the composition of ethnic groups in an area.

**10:15**

MALARIA AND ECOLOGY;TAMILNADU CASE, Ashok K. Dutt, Vishnukumari, Department of Geography, University of Akron, Ohio and Hiran M. Dutta, Department of Biological Sciences, Kent State University, Kent, Ohio

Malaria was "eradicated" from many of the states of India under the National Malaria Eradication Program started in 1958. But, since 1965, a resurgence of the disease has begun with diffusion starting from a few pockets. In Tamilnadu, there are three such pockets, Madras city, Ramanathapuram and Salem. More than 70% of the total cases recorded in Tamilnadu in 1976, had occurred in these pockets. From these areas malaria has spread to the rest of the state. The disease is more wide-spread in the last half of the year, when rainfall, R.H. and temperature conditions are favorable for the vector activity. In October and November, the areal extent of malaria is at its maximum. After December, large-scale prevalence of the disease shrinks to the three pockets. In Ramanathapuram the cases are mostly imported by pilgrims coming from all over India; climatic conditions being favorable all the year round. City-culture, suitable R.H., temperature and lack of effective anti-malaria programs are responsible for all-year malaria in Madras. Salem, where the disease is prevalent throughout the year, despite unfavorable temperature and R.H. in certain months of the year, the malarial pocket in an extension of more intense disease-core in the adjacent Karnataka state. Though all of Tamilnadu except the hills, is climatically susceptible to malaria, year-round spread of the disease is limited. The existing pockets pose potential endemicity.

**10:30 A.M. BUSINESS MEETING**

## GEOGRAPHY

10:45

RELIGIOUS DIVERSIFICATION IN INDIA. Satish Davgan, Department of Geography, Kent State University, Kent, Ohio.

India is a multireligious country with Hindu dominance. Hindus constitute about four-fifths of the population. Believers of Islam, Christianity, Sikhism, Buddhism and Jainism exist in sizeable numbers. All these religious groups have intermingled in such a way that majority of the districts are inhabited by people believing in different religions. The more the religious mix, the greater the basis for cultural heterogeneity. An attempt has been made to measure the religious diversity by a statistical formula for districts and cities. The central and southern parts of India, where Hindus are dominant are the regions of lower diversity. But in the northeastern part of the country, where other religions coexist with Hinduism, diversity is very pronounced. In the Western part where Sikhism, Islam, and Buddhism have sizeable followers the diversity is more pronounced. In general, the religious diversity is positively correlated with the proportion of non-Hindu population. There are some exceptions such as districts of Punjab, where non-Hindus (Sikhs) predominate; this results into lesser diversity. The same is true of the Christian-majority districts of east India. In general, most of the cities show higher diversity than the surrounding areas. The core Hindu areas in the north as well as in the southern part of India, have minimal diversity, whereas it is only in the periphery of the country that other religions have made sizeable inroads showing greater diversity.

11:00

MARKOVIAN ANALYSIS OF REGIONAL MIGRATION IN NEPAL. Mohan N. Shrestha, Department of Geography, Bowling Green State University, Bowling Green, OH 43403

The population of Nepal is increasing at the rate of 2.1 percent on the average. The highest growth rates occurred in the Central and the Western Plains, followed by Kathmandu Valley and the Eastern Plain. The most important factors producing these variations in the annual growth rates of population over the geographic regions were internal migration and immigration, particularly from the adjoining densely populated districts of Northern India. To describe the existing spatial mobility and to project future population totals for these geographic regions, a transition probability matrix was developed. It provided a great deal of information about the mobility pattern and useful insights concerning the observed differential behavior of the population. But its utility in the long term analysis and future predictions was highly limited because of the changes in the migration propensities over space in time.

11:15

A STUDY OF SPATIAL DISTRIBUTIONAL PATTERN AND DEMOGRAPHIC CHARACTERISTIC FEATURES OF AKRON-KENT ASIAN INDIANS. Ramesh Chandra Dhussa, Department of Geography, Kent State University, Kent, Ohio 44242

The specific task of this study is to explore and investigate the distributional pattern and social structure of the Asian Indians living in Akron, Kent, Stow, Munroe Falls and Barberton area of Akron S.M.S.A. In settlement pattern, it has been found that there are four clusterings of the Asian Indians in this region. Clustering guided by income group depicts that language of the region of origin are not the factors which have generated this clustering. The site selection of their houses is very much like that of Americans. In social structure Asian Indians represented fourteen states of India. Most of them are highly educated, either as graduate students or professionals as teachers, doctors, and engineers. Most of the students are single and professionals have small family sizes. Hindus are largest in number followed by Christians and Sikhs. Spatial mobility pattern is largely dependent on income than anything else. Students do not go to far distant places for recreational purposes, while professionals do. Christians go to neighboring churches for worship every week, while very few Hindus and Sikhs go to Pittsburg and Cleveland for worship. The frequency is also very low in this case. There is no Hindu or Sikh temple in Akron area.

11:30

MEASURING FERTILITY DECLINE IN THE DEMOGRAPHIC TRANSITION. Joseph G. Spinelli.  
Department of Geography, Bowling Green State University, Bowling Green, Ohio 43403

In population geography, a commonly discussed concept is the process of demographic transition, the change from high to low vital rates. The model of demographic transition assumes that all societies at one time had extremely high fertility and mortality rates, and for various social, economic, and cultural reasons, a reduction in the mortality rate occurred followed later by a reduction in the fertility rate. One can measure the degree of progress countries have made in going through the transition by setting up a yardstick with a standard upper and lower limit for fertility. As crude fertility levels better reflect socioeconomic conditions in most nations than do crude mortality rates, owing to the greater ease of reducing mortality and morbidity among the developing parts of the world, the death rate will not be examined in this exercise. A more meaningful statistic than the Crude Birth Rate (CBR) is the Total Fertility Rate (TFR) which indicates the total number of births to a cohort of 1000 women who bear children at the age-specific fertility rates in effect at a given time. The TFR appears to be a more informative measure to students in the classroom than the CBR, as the TFR can be reduced to a per woman statistic. Donald J. Bogue has derived a formula that converts the commonly available CBR to a TFR. By setting a maximum and minimum level for the TFR, one can measure the progress each country has made along the fertility path of the demographic transition.

## SECOND MORNING SESSION, 9:00 A.M.

Millett 056

Vice President, ASHOK K. DUTT, Presiding

9:00

A STUDY OF LOCAL VOTING WARD REPRESENTATION IMBALANCES IN SUMMIT COUNTY, OHIO.  
John E. Mulhauser, Department of Geography, University of Akron, Akron, Ohio

U.S. Supreme Court decisions in the 1960s demanded consideration of equality of numerical representation among voting districts. As a result, considerable political redistricting, of both Federal and State voting districts occurred. The basic question of this study was, "Do local voting districts have equal numerical representation?" A study of the local wards of the six largest communities in Summit County shows that, in some cities, considerable numerical imbalance exists.

Whether or not a community had redistricted after the 1970 Census was obviously important to the results. Inequalities appeared, however, in both cities where recent growth has been evident, and in established cities of stable population growth character. Failure to redistrict involves political reluctance, incorrect evaluation of lack of need, and a general ambiguity of responsibility or authority. The existence of "at-large" representatives, to a degree, alters the significance of the effect of voting ward imbalances.

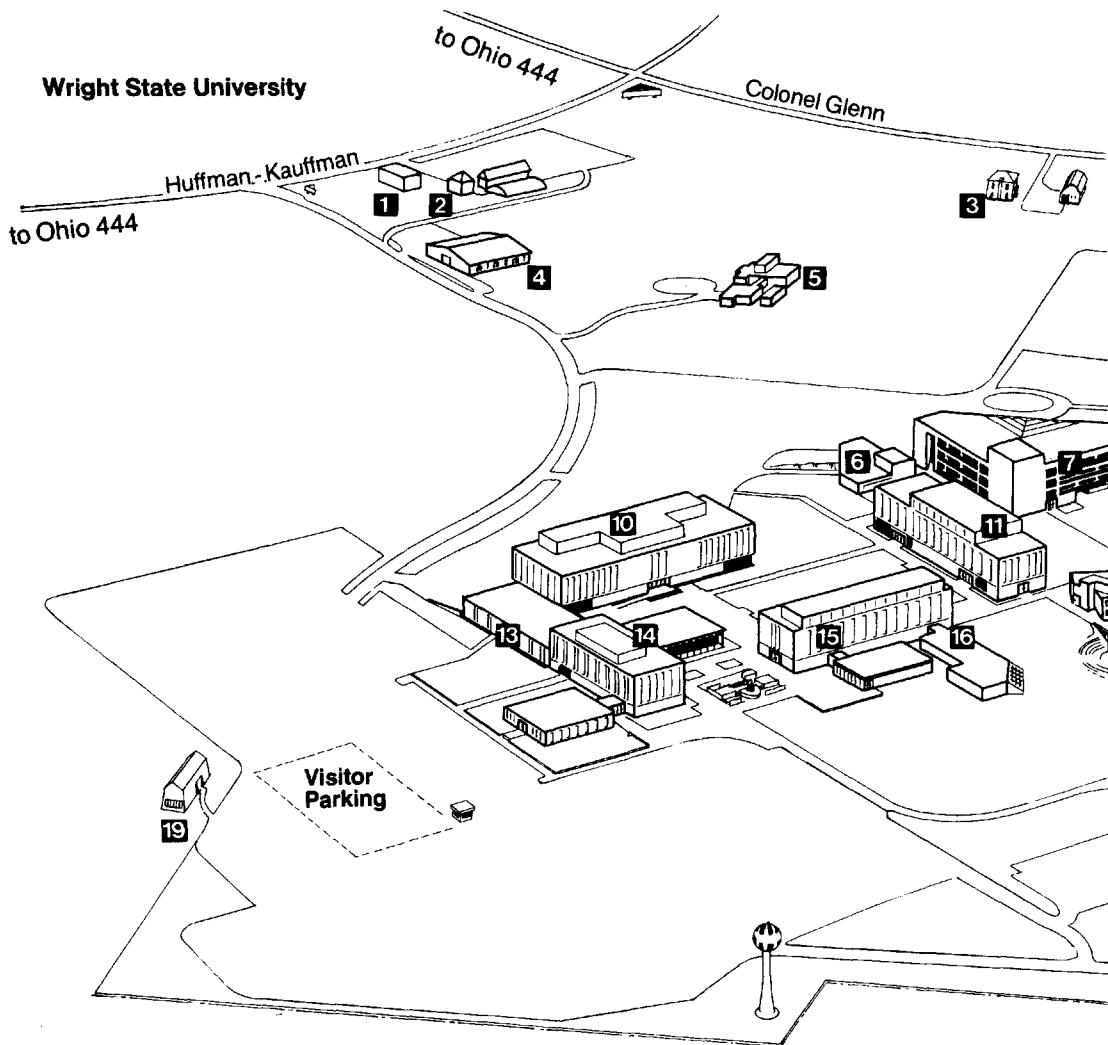
9:15

THE ENERGY CRISIS AND RESIDENTIAL ELECTRICITY USAGE. Bruce W. Smith, Department of Geography, Bowling Green State University, Bowling Green, Ohio 43403.

During the 1970's, trends in the American electric utility industry have been transformed. Whereas the years before 1970 were marked by stable residential electricity prices, the manifestations of the "energy crisis" have resulted in rising prices. Some analysts believe rising prices will dampen rates of increase in electricity use, while other experts argue that the effects of price increments will be overshadowed by other developments and continued growth of consumption will occur.

The purpose of this research is to assess the influence of price increases on the demand for residential electricity. Multiple regression analyses were performed for 1970 and 1975 to determine what, if any, alterations, had occurred in the relationships between residential usage by states and four independent variable -- electricity prices, natural gas prices, per capita incomes, and average temperature.

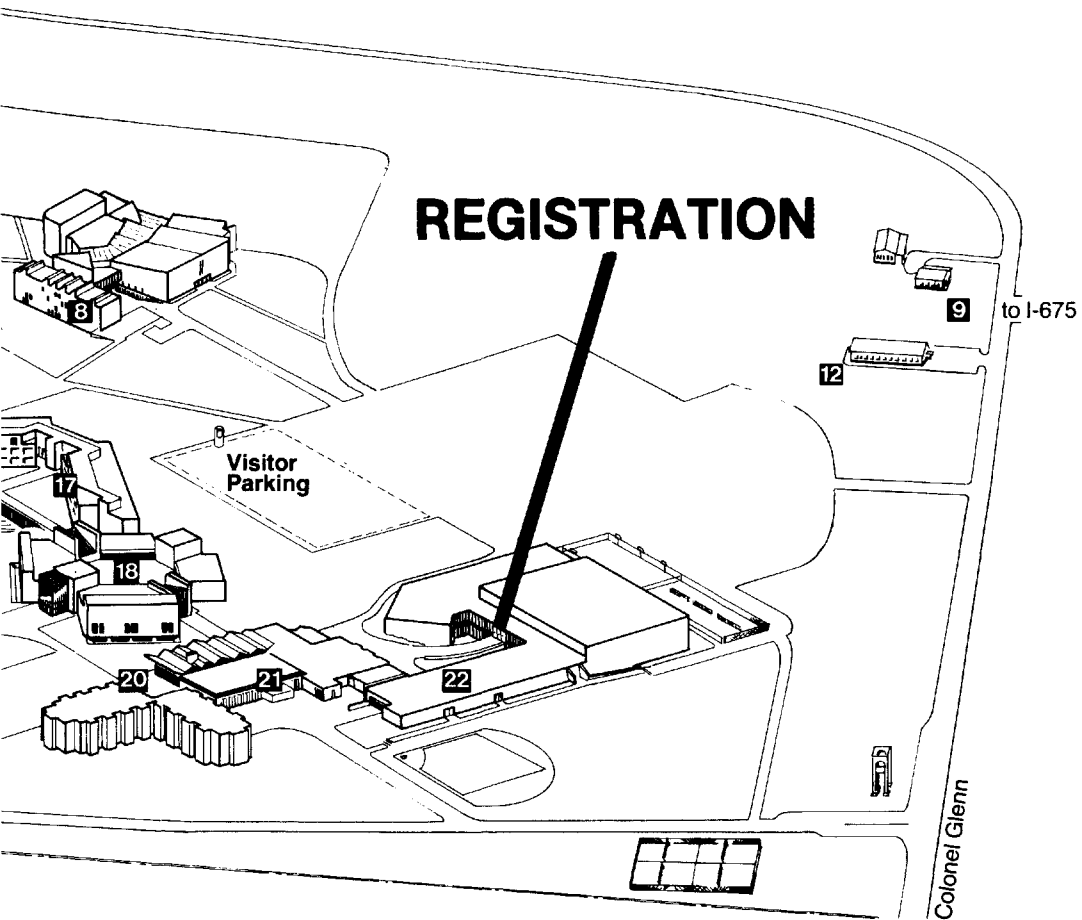
In both years electricity price was the major factor associated with residential usage and temperature was of secondary importance. Natural gas price was a significant factor in 1970, but not in 1975 because of the shortage of natural gas. Furthermore, the association between electricity price and consumption significantly weakened between 1970 and 1975 due to the lack of substitutes for electricity. Utility planners should not anticipate large reductions in electrical loads as long as no electricity substitutes are available and consumers are locked into a given stock of electrical appliances.



Allyn Hall 14  
 Biological Sciences Building 17  
 Brehm Laboratory 16  
 Creative Arts Center 8  
 Fawcett Hall 11  
 Gaza House 2  
 Graphics Workshop 12  
 Hamilton Hall 20  
 Medical Sciences Building 18  
 Millett Hall 10  
 Oelman Hall 15  
 Physical Education Building 22



← North



Riding Club 9  
Rockafield (President's) House 5  
Service Building 1  
Service Building/Fine Arts Annex 3  
Student Services Building 13  
Television Center 6  
University Center 21  
University Library 7  
Warner House 3

Adjacent to Campus  
Campus Ministry Center 19

## GEOGRAPHY

9:30

RECENT CHANGES IN THE FUEL SUPPLY OF ELECTRIC POWER PLANTS. John Hiltner and Bruce W. Smith, Department of Geography, Bowling Green State University, Bowling Green, Ohio 43403.

The national energy shortage and environmental regulations are reshaping economic decision-making in the United States. One example of this is in the operations of the electric power industry. Numerous functions of electric utilities are affected by environmental problems, such as water and air quality standards.

Since, when building a thermal plant, utilities have the option of fueling it with coal, oil, or natural gas, the traditional practice has been to select the lowest cost fuel. With the advent of anti-air pollution ordinances in the 1960's, however, utilities were forced to consider a non-price variable in the fuel selection decision -- compliance with air quality statutes. Hence, some utilities switched from "dirty" fuels (high-sulphur coal) to cleaner fuels (oil and gas). Since the early 1970's, however, shortages of natural gas have forced some plants to convert either to coal or oil and have eliminated natural gas as a fuel alternative for new plants in most sections of the country.

The purpose of this research is to examine the temporal variations in the regional patterns of fuel supply of steam-electric generating stations in the United States between 1965 and 1971, before and after the inception of air quality standards, and between 1971 and 1976, before and after the advent of natural gas shortages. By comparing the regional patterns in the two sets of years, the impacts of environmental and economic trends can be assessed.

### THE HUMANISTIC TRADITION IN GEOGRAPHY

9:45

Michael G. Nickerson  
Department of Geography, Miami University, Oxford, Ohio 45056

Humanistic geography is not a novelty within the discipline, but rather an expression of a long tradition in geography. The recent philosophical emphasis in articles on the topic provides intellectual justification for such a tradition. Humanistic geography is a necessary part of the discipline; it holds a vital role in the future as a vehicle for methodological criticism, for the stimulation of further research ideas, for the exploration of underlying values in research, and for the encouragement of priority decisions concerning research money and talent.

10:00

SOME COMMENTS ON WILLIAM APPLEBAUM: HIS WORK AND ITS IMPACT  
Phil Auble Department of Geography Miami University Oxford, Ohio 45056

The efforts of this pioneer in marketing geography and store location research are examined. The methodology developed by Applebaum is discussed, along with an analysis of the major influences on his work. Two additional facets of his work are presented: first, his nomothetic viewpoint towards marketing geography and store location research; second, his emphasis on the contributions geographers can make in the business world. Applebaum has received substantial recognition, both abroad and in the states, primarily from the business world. Unfortunately for the field of geography, few geographers have chosen to work in the areas for which he is famous.

10:15

COLONIAL MENTALITY: A GEOGRAPHIC VARIABLE IN INTERNATIONAL RELATIONS.  
Thomas D. Anderson, Department of Geography, Bowling Green State University, Bowling Green, Ohio 43403

The concept of colonial mentality is offered as an aid toward the interpretation of current events. Defined as an aspect of collective cultural personality, it is a residue of an earlier period of foreign domination. Because colonial mentality is manifested most strongly among members of a nation's elite, its presence is often a disproportionately significant element in all manner of international contacts. Wilbur Zelinsky's map of the comparative degrees of Europeanization of the world is used as a guide in the delineation of the distribution of Western colonialization. Highlighted are those nations without a colonial past. Brief descriptions of the culture history and recent actions by the leaders of several nations serve to illustrate contrasts in the role of colonial mentality. Examples are from the Middle East, India, and China. Some values and deficiencies of the concept as a predictive tool are discussed in closing.

**SPECIAL SYMPOSIUM: Russian Geography, 10:45 A.M.**  
**Vice President, ASHOK K. DUTT, Presiding**

- 10:45** SOIL TEMPERATURES OF THE ARCTIC AND SUBARCTIC WEST SIBERIAN BASIN; CHARACTERISTICS AND CONSTRAINTS.  
 Clyde L. Smith and Jordan A. Hodgkins Geography Department, Kent State University  
 Kent Ohio, 44242

Recent Soviet and American penetration of Arctic and Subarctic regions in the search for and development of oil and gas resources has resulted in the encountering of unfamiliar environmental factors whose presence exerts severe constraints and hazards on man's activities. Soil temperature characteristics of the West Siberian Basin from the surface of the soil to a depth of 3.2 meters are examined in this paper. Average monthly and yearly soil temperatures as well as the maximum and minimum amplitudes are analyzed. Comparisons are made between air temperatures and temperatures of the upper soil layer, including contrasts in the frost free periods of the air and soil. Soil temperatures and their relation to soil types and natural regions are depicted.

- 11:00** TRENDS IN SOVIET COAL PRODUCTION, 1945-1975.  
 Thomas S. Matlock Geography Department, Kent State University,  
 Kent, Ohio 44242.

Trends in Soviet coal production are analyzed for the 30 year period 1945-1975. Data on total coal production, including hard coal, anthracite, and brown coal classifications, reveals increasing outputs in total coal and hard coal categories, with periodical fluctuations in anthracite and brown coal production. Regional shifts in production are examined over the same period, showing a continuing development of the reserves east of the Urals. Basin data, where available, has been used to demonstrate the various regional shifts. A comparison of the average heat values of specific coal basins evaluates the significance of shifting basin production totals.

- 11:15** A COMPARISON OF U.S. AND U.S.S.R. STANDARDS FOR CLASSIFYING COAL RESERVES  
 Mason H. Soule and Michael F. Papirtis Geography Department, Kent  
 State University, Kent, Ohio 44242

This paper depicts the many differences which exist between the U.S. and Soviet standards for classifying coal reserves. As a prelude to accurately assessing Soviet coal potential, investigators must become aware of the standard criteria for Soviet reserve computation. Accurate evaluation of Soviet data is dependent upon the investigator's familiarity with the standards by which that data is derived.

It is established that in certain areas of reserve computation, the dissimilarities between the two systems are so great as to present the potential for errors in interpretation and assessment. Distinctions between the Soviet and American standards regarding the ranking of coal, reserve categories, ash and sulphur contents allowable, thickness of overburden, and seam thickness are elucidated in the paper.

- 11:30** THE DEVELOPMENT OF HYDROELECTRIC POWER IN THE GEORGIAN SOVIET SOCIALIST REPUBLIC  
 Byron J. Butler, Geography Department, Kent State University,  
 Kent, Ohio 44242

Electrification has played a key role in the rapid industrial development of the Soviet Union. Early Soviet planners placed a substantial emphasis on hydroelectric installations. This presentation is concerned with the development of hydroelectric power in the Georgian S.S.R., its utilization and potential. Comparisons and contrasts are made with the Soviet Union as a whole. Energy balances are examined, and their changes within the Georgian S.S.R. noted.

## GEOGRAPHY

- 11:45** POPULATION CHANGES IN ESTONIA, 1939-1970  
Mary Ann Ulan Department of Geography Kent State University Kent,  
Ohio 44240

The Estonian people have only experienced self-government during the period between the two world wars. For most of its modern history, the Estonian territory has been part of other empires, most notably the Danish, Swedish, and Russian. During World War Two, both the Germans and Soviets occupied Estonian national territory for varying lengths of time. The Soviets' final occupation ultimately resulted in the incorporation of Estonia into the USSR as a union republic. Analysis of the available census data, from 1939 to 1970, provides evidence that marked changes in the ethnic composition of Estonia occurred in the war years and the Soviet period.

### SPECIAL SYMPOSIUM: The People's Republic of China, 2:00 P.M. Millet 173 Vice President, ASHOK K. DUTT, Presiding

- 2:00** A COMPARATIVE VIEW OF INDIAN AND CHINESE CITIES  
Allen G. Noble  
Department of Geography  
The University of Akron  
Akron, Ohio 44325

Asian cities evince a form and structure quite unlike that of western cities which are more familiar to social scientists in the United States. This study, based partially upon earlier published works and partially upon the author's travels and observations, compares the form and structure of Indian cities with those of China.

In China, because urban places are equated with the former Imperial rule and with western exploitation, a negative attitude persists toward urbanism. In India, the attitude towards urbanism is more ambivalent. Although cities in both countries are in the midst of processes of continual redevelopment to better fit them for their modern day populations, they still are essentially structured in a traditional mode.

Type of original nucleus, form and extent of central business district, direction of modification of central city, presence and function of city walls, influence of long term planning activities, form and arrangement of open space, and character of residential neighborhoods are major aspects of urban geography which differ in Indian and Chinese cities.

- 2:15** CHINESE POPULATION GEOGRAPHY. Lawrence A. Hoffman. University of Toledo. Toledo, Ohio, 43606.

Evidence collected in summer 1977 indicates the Chinese population limitation program has generally been effective in the cities (20% of the total population), but has been less effective in the countryside. The total population has increased from 583 million in 1953 to about 950 million in 1977. The average annual rate of growth was about 2-2 1/2% in the 1950's, 2% in the 1960's, and is now about 1 1/2-2% in the 1970's. Cities are now recording 1/2-1% annual natural increase rates, with the countryside still averaging 2% or more. Since the early 1960's, Chinese policy makers have been fully committed to comprehensive family planning, ideally limiting urban families to two children, and rural families to three. As long as urban population is strictly limited in size, as at present, the two children urban ideal will soon be realized and maintained. But the three children rural family seems decades away, if trends like the past decade are maintained.

- 2:30** GEOGRAPHERS' PERCEPTION OF CHINA'S ENERGY SITUATION. Jack Williams, Michigan State University, East Lansing, Michigan 48824.

abstract not available

**2:45 THE KARST TOPOGRAPHY OF KWEILIN, PEOPLE'S REPUBLIC OF CHINA: A PHOTOGRAPHIC PRESENTATION.**

Jordan A. Hodgkins Geography Department, Kent State University, Kent Ohio 44242

Karst topography presents a unique and dramatic surface and underground landscape in many regions of the world. It achieves its most dramatic form in southwestern China extending on into the northern sector of Viet Nam. In the Kweilin region of China its formation results from three principal factors. The immense thickness of the limestone and dolomite rocks are over 300 meters in depth. Subtropical rainfalls averaging 2000 mm per year provide the solution medium. The intensity of this precipitation is magnified by the fact that 2/3 rds. of it occurs between April and July. Ease in solubility of these rocks is evidenced by the fact that 50 cubic meters of lime are removed in solution per 12 square km. each year.

**AFTERNOON SESSION, 3:15 P.M.**

**Millet 173**

**Vice President, ASHOK K. DUTT, Presiding**

**3:15 CONGRESSIONAL REDISTRICTING IN OHIO: PATTERNS OF COMPARATIVE BOUNDARY STABILITY, 1964-1976.** Thomas D. Anderson and Keith Rice, Department of Geography, Bowling Green State University, Bowling Green, Ohio 43403.

One result of the 1962 Supreme Court decision that mandated "equal population" as a criterion has been the wide-spread reshaping of Congressional Districts in the United States. This paper reports on an effort to identify cartographically the scope and distribution of these changes in Ohio over the period 1964-1976. Using the districts of the 89th Congress as a base, all boundary changes outside metropolitan areas were plotted on separate maps. From these patterns a composite map of boundary changes was constructed. The resultant map served to identify zones of relative stability and instability with regard to Congressional redistricting in Ohio. Several of these zones were subjected to brief geographic analysis. Although the methodology requires further refinement, it offers promise as an aid for more detailed studies of the political geography of Ohio and for wider application on the national level.

**3:30 CLIMATIC CHANGE IN HISTORIC TIME: A REVIEW OF THE DEVELOPMENT OF THE CONCEPT OVER THE YEARS.** Sana Samy. 11991 Snider Rd., Cinti., Ohio, 45242.

The paper reviews the concept of climatic change as it was attacked by geographers as well as other kin scientists in search for an answer to this most complex issue. It follows the recurring interest in the subject over the years, tying commonalities or major consensus in the mass of publications with possible triggering effects. Also tying it with dominant influences of the time, emphasizing the line of geographic thought.

Four different stages are discussed - the second half of the nineteenth century when climate was thought to be invariant, the time around the turn of the century when environmental determinism dominated the thoughts affecting, among other things, the theme of climatic change, the following period when anti-deterministic sentiments rendered a theme, closely tied in the minds with environmental controls, unpopular, and, finally, the contemporary period when a falling level of food production has triggered a profound interest in understanding climatic behavior.

## GEOGRAPHY

- 3:45** "SITE SELECTION PROCESS: SEA WORLD, AURORA, OHIO". Carl R. Roxbury, Department of Geography, The University of Akron, Akron, Ohio 44325 and Thomas L. Nash, Department of Geography, The University of Akron, Akron, Ohio 44325.

Before a business gets involved in the geographic details of locating a site for its activities, it needs to identify the objectives necessary for developing new facilities. The company then should explore and identify the tangible and intangible factors that could affect any site selection decision. In the realm of the amusement park/theme park industry market potential is the primary factor in the location of a park with highway accessibility as an important secondary factor.

When Sea World, Inc., a California based theme park began a search for an expansion site several areas and cities in the United States were considered. Besides excellent market potential and proximity to highways this particular company desired to locate near an established or well-known amusement park. This paper indicates why market and transportation were considered most effective in Ohio and what additional factors influenced the final selection of the particular site in Aurora.

- 4:00** THE SPATIAL CONDITIONS OF FEDERALISM  
by Michael Huebsch and Bob J. Walter  
Ohio University

Robinson (1961) has called federal states "the most geographically expressive of all political systems," presumably because of the regionalism extant such federations. Yet no one has systematically tested this assumption. In a comparative analysis of twenty-five federal states and twenty-five unitary ones, using eight specifically spatial variables, the above hypothesis is rigorously tested. Federal states do differ from unitary ones but not in the expected way.

- 4:15** MEASURING POPULATION PRESSURE: FROM THEORETICAL TO PRACTICAL  
by Brian Van Atta and Max West  
Ohio University

Numerous measures are available for estimating carrying capacity and calculating population pressure. A review of these suggests that Carneiro's 1972 formula is the most appropriate one for an Ohio University research project in San Pedro Columbia, Belize. Based on the variables in his formula, a questionnaire was constructed and in December, 1977, was used in the field research. Although the questionnaire provided useful data, there were problems with some sections. Changes for specific variables are recommended.

- 4:30** POPULATION PRESSURE IN SAN PEDRO? A LOOK AT SOUTHERN BELIZE  
by Ben Masiolo and Agnes Musyoki  
Ohio University

Indian farmers in San Pedro Columbia, Belize operate under a variety of constraints -- physical, political, technological. In adjusting to these constraints, the Ketchi farmers have developed a productive and complex farming system. It utilizes the variety of environmental zones present, distributes labor requirements throughout the year, and provides an ample supply of staple foods. As found in an Ohio University research project conducted in December, 1977, however, there are danger signals for the system, given the current population growth and change in society.

- 4:45** TORSTEN HAGERSTRAND AS A REFLECTION OF CONTINUAL CHANGE IN GEOGRAPHY.  
Mark Kachelein, 714 South College, Oxford, Ohio, 45056.

Selected works of Torsten Hagerstrand are considered as exemplary of the recent evolution in geographic methodology. A brief sketch of Hagerstrand's initial attempts at modeling innovation diffusion is offered and the sensitive distinction between model building and determinism is discussed. Hagerstrand's cumulative contribution is shown to be a product of the dynamism which characterizes the Modern Swedish tradition in Geography. Hagerstrand's efforts in urban planning and social forecasting are reviewed and it is suggested that Hagerstrand's most profound impact might lie in the development of applied time-geography. The temporal dimension of Hagerstrand's work is shown to depart from the more exclusively spatial framework typical within contemporary research. Finally comment is directed toward Hagerstrand's endorsement of phenomenology as a legitimate geographic tool.

# G. SECTION OF CHEMISTRY

MORNING SESSION, SATURDAY, APRIL 22, 9:00 A.M.

Colman 112

Vice President, LARRY WILSON, Presiding

9:00

EXPERIMENTS FOR TEACHING SOLAR ENERGY CONCEPTS. A PROGRESS REPORT.

Joseph S. Cantrell, Chemistry Department, Miami University, Oxford, Ohio 45056

Jack L. Mason, McGuffey Laboratory School, Miami University, Oxford, Ohio 45056

Experiments have been developed to illustrate the principles of solar energy absorption and storage. These experiments also teach principles of energy conservation by simultaneous, parallel calorimeters constructed of low cost local materials (grocery store). These experiments have been checked against a solarimeter operating nearby. The data obtained are good enough to generate student interest and enthusiasm. Efficiency calculations can be made for the results from the simple equipment by comparing the results with those from the solarimeter (when one is available). The results and experiences will be presented for these experiments that were given to first year college students, to graduate students in the Institute of Environmental Science and to 7th and 8th grade students in McGuffey Lab School.

9:25

CHEMICAL EVOLUTION AND INTRODUCTORY CHEMISTRY

Lauren R. Wilson, Department of Chemistry, Ohio Wesleyan University, Delaware, Ohio 43015

As a result of rising student apathy toward learning fundamental concepts in chemistry, a unit of study which features astrochemistry and chemical evolution has been developed. These topics are used to trace the progression from simple fundamental particles to the more complex species which may have been important in pre-biological times. This approach to learning basic chemistry was developed as a part of a non-chemistry majors course in environmental chemistry and the paper will discuss this application. Approaching introductory chemistry in this manner builds upon the normal student interest in cosmology and the origin of life and permits the study of fundamental chemical concepts utilizing a vehicle which is relevant and interesting. It also provides an excellent forum for discussing the validity and limits of experimentation and the responsibilities of scientists in selecting research areas.

9:45

THE  $P^H$  OF NATURAL WATERS IN THE U.S.A. Bruce V. Weidner, Miami University, Department of Chemistry, Oxford, Ohio 45056.

The  $P^H$  of the water of rivers, streams, lakes and ponds in the U.S. north of Oxford and from New England to California were measured. Some measurements were made in Canada and a lot in Alaska.

The  $P^H$  of only three different samples were between 6 and 7. The remainder were all a  $P^H$  of 7 or higher. The highest was a  $P^H$  of 9.8. Many samples were taken of the same body of water many miles apart.

11:10

TRANSLUCENT  $Y_2O_3$  PREPARED AT VARIOUS PRESSURES, F.W. Vahldiek, Air Force Materials Laboratory, LBN<sup>3</sup>, Wright-Patterson AFB, OH 45433.

Translucent yttrium oxide with and without additions of  $ThO_2$  was made at pressures up to 12,000 bars and temperatures up to 1600°C. An overall decrease in electrical resistance with increasing temperature and pressure was determined. For  $Y_2O_3$  pressed at 5 kbars and temperatures ranging from 20-1200°C, a slope of  $dR/dT (P) = -0.169 \Omega/^\circ C / bar^{-1}$  was found. Yttrium oxide pressed at 25 kbars and temperatures up to 1200°C resulted in a slope of  $dR/dT (P) = -0.001 \Omega/^\circ C / bar^{-1}$ . The activation energy for electrical conduction at 1 bar pressure in air was determined to be 1.96 eV, and for  $Y_2O_3 + 0.5 m/o ThO_2$  1.89 eV. The rate equation for electrical conduction of  $Y_2O_3$  at 1 bar was determined to be  $\sigma = 110 e^{-23000/T}$ . For  $Y_2O_3 + 0.5 m/o ThO_2$  the rate equation resulted in  $\sigma = 110 e^{-21900/T}$ .

## CHEMISTRY

**10:30** THE CYANOETHYLATION OF DIHYDRIC PHENOLS Frank J. Koszyk, Robert P. Lynch and Robert G. Johnson, Xavier University, Department of Chemistry, Victory Parkway and Dana Avenue, Cincinnati, Ohio 45207

**10:55** ATTRACTIVE FORCES BETWEEN MOLECULES IN NONPOLAR LIQUIDS. R. Thomas Myers, Dept. of Chem., Kent State Univ., Kent, OH 44242

Start with the London formula for dispersion forces between molecules,  $E = 3\alpha^2(h\nu_0)/4r^6$ . For spherical molecules in a liquid the density will be proportional to  $M/r^3$ , where M is molecular weight. The atomic polarizability  $\alpha$  is proportional to the molar refraction, R. The fundamental vibration energy  $h\nu_0$  is approximated closely by the ionization energy, I. The boiling temp.,  $T_b$ , is a constant times the energy of vaporization (Trouton rule). Putting all these in the equation and rearranging gives  $T_b^2 \propto RI^2/V_b$ , where  $V_b$  is molar volume at the boiling temp. Graphs of data for the inert gases and for the Group IV halides give excellent straight lines.  $SiCl_4$  is not anomalous; it boils lower than  $CCl_4$  because of low density. This is mostly due to the much longer bond length of Si. For cylindrical molecules the density  $\propto$  to  $M/\pi r^2 L$ , where L is length of the molecule. A similar development gives:  $T_b^2 \propto RI^2 L^{1/2}/V_b^{3/2}$ . A graph of data for alkanes (ethane through octane) gives an excellent straight line.

**11:20** STOICHIOMETRY OF HYDRATES. David Dingley, State University College, Fredonia, N.Y. 14063

Loss of weight of hydrates upon being heated is used in general chemistry laboratory experiments to illustrate the law of constant proportions. Student results usually indicate there is not a small whole number stoichiometric relationship between the anhydrous compound and the water of hydration. However, restriction of choice of hydrates and use of appropriate experimental conditions lead to marked improvement in stoichiometry and to the reinforcement of understanding of the law of constant proportions by students.

**11:40 A.M. BUSINESS MEETING**

**SPECIAL SYMPOSIUM: Toxic Substances in High School  
and College Science Laboratories, 2:00 P.M.  
Oelman 112**

(Jointly Sponsored by Chemistry and Science Education Sections)  
For details contact Dr. Larry Wilson, Acting Provost,  
Ohio Wesleyan University, Delaware, Ohio 43015



# H. SECTION OF SCIENCE EDUCATION

MORNING SESSION, SATURDAY, APRIL 22, 9:00 A.M.

Millet 174

Vice President, CAROLYN FARNSWORTH and Membership Chairman,  
RUSSEL HANSEN, Presiding

**9:00** HURON ROAD HOSPITAL MEDICAL LECTURES FOR HIGH SCHOOLS. Franklin O. Smith,  
C.F. Brush High School, Lyndhurst, Ohio 44124

This will be a description of the Medical Insight Seminars which have been presented by the staff of Huron Road Hospital to high school students who are interested in a career in some phase of medicine. Topics presented include psychiatry, cardio-vascular problems, orthopedics, plastic surgery, obstetrics and gynecology, neurosurgery, and endocrinology.

This paper will discuss the format of the seminars and attempt to illustrate how similar programs may be started by interested teachers.

**9:20** "TURNING THE OVERHEAD PROJECTOR INTO A PLANETARIUM FOR PRACTICAL ASTRONOMY:  
Jack L. Mason and Anne Settevendemie, McGuffey Lab School, Miami University,  
Oxford, Ohio 45056.

Astronomy is an exciting subject to teach especially if some practical observation activities can be included. However many teachers become frustrated because it is difficult (due to weather problems and other conflicts) to hold enough student interest to get them to carry out their own careful observations. Also celestial planetarium equipment is much too expensive for most schools. With a little work and the use of an overhead projector, there is a solution to these problems. The main purpose of this paper is to demonstrate how teachers can use plastic and cardboard to design an apparatus that will reproduce a nearly perfect starry sky and how to use the equipment to give astronomy activities to students of all ages.

Lessons for very young students should involve mainly the northern sky. Initially just becoming familiar with the Big and Little Dippers and perhaps the north star might be sufficient. More interested classes may want to learn all the circumpolar constellations and perhaps learn how to determine the seasons by the Big Dipper position. Upper elementary students will enjoy studying many objects visible in the southern sky. Most of these students can learn several constellations for each of the seasons.

**9:55** IS THE SCIENCE, ESPECIALLY CHEMISTRY, CURRICULUM KEEPING PACE WITH  
CURRENT DEMANDS OF GOVERNMENT AND INDUSTRY?

E.E. Sandmeyer, Ph.D. 610 Foxhurst Road, Pittsburgh, PA 15238

Is the recent graduate in chemistry, biochemistry, chemical engineering or general science that enters a position with the Government or industry adequately prepared to face the current demands?

Should the general or specific science major be exposed to recent governmental rules and regulations concerning the environment and industrial operations?

Should the scientist or engineer, e.g. have an idea of what types of chemicals may be permitted or will be banned in the future?

Is there a way to make such predictions?

Should the science student be exposed to industrial toxicology?

What would be the benefits of such preparation or the disadvantages for not preparing someone adequately?

## SCIENCE EDUCATION

- 10:15** THE USE OF THE MOIST CHAMBER TECHNIQUE IN THE STUDY OF PLASMODIAL SLIME MOLDS:  
AN EXERCISE IN HIGH SCHOOL BIOLOGY. Karl Leo Braun, North High School, 701 E. Home Road,  
Springfield, Ohio 45503

The use of *Physarum polycephalum* in life cycle studies is well documented in the literature. However, the high school biology teacher is not limited to this one species. Many other species of Myxomycetes (and a great variety of other organisms) may be isolated in the laboratory through the use of a relatively simple moist chamber technique. If tree bark is replaced in the moist chamber, tiny corticolous Myxomycete fruiting bodies usually develop on the bark within 24 hours. These plasmodial slime molds (Echinosteliaceae and Liceaceae) are quite small, usually less than one mm tall, and are best observed with the use of a dissecting scope. Occasionally larger Myxomycetes appear (Cribariaceae, Trichiaceae, Dianemaceae, Stemonitaceae, Didymiaceae and Physaraceae) which are easily visible to the naked eye. Plasmodia may also migrate onto the moist paper or agar, where they may later fruit. These same plasmodia may be transferred to other dishes containing bark-extract agar, where fruiting bodies may form in large numbers, providing the opportunity to culture the organisms from spore to spore. This laboratory investigation will lead students to an area of research in which there are many unanswered questions.

- 10:30** A MULTIDISCIPLINARY MOUNTAIN FIELD EXPERIENCE. Jack L. Mason, McGuffey Lab  
School, Miami University, Oxford, Ohio 45056.

Schools often encounter the problem of interfering with other classes when one teacher wants to take a class on an extended field trip. This problem came up at McGuffey Lab School when the science teacher decided to take the seventh and eighth grade earth science students on a week long geology trip to the Potomac Highlands of West Virginia. The solution was a simple one, involve all the subjects and take the other teachers too. The result was a multidisciplinary venture involving the study of geology, biology, language arts, social studies, math, music, art, and recreational activities in a rather unique mountain environment. Each subject area was represented by a teacher who could provide guidance and instruction. Field trip sites and activities were selected months before the trip and students were given hours of preparatory instruction. Some of the science activities included identification of local rocks and minerals; study problems involving mountain building evidence such as folds, faults, and volcanism; hiking through a cave, visiting a trout hatchery; and hiking in the high country to identify arctic-like vegetation and photograph beaver workings. Other activities were a concert exchange with a mountain school, an interview with a lady-leader of a black community in a remote mountain area, writing descriptions of the physical regions, writing character descriptions, composing a sensory experience, and numerous recreational activities.

- 11:55** THE ROLE OF INFORMATION STORAGE IN THE COGNITIVE PROCESS OF SYNTHESIS  
Dr. C. L. Schrader, Route #4, New Philadelphia, Ohio 44663

This study was designed to investigate the effect of the timing of the presentation of two subordinate informational concepts in the cognitive process of synthesis as defined in The Taxonomy of Educational Objectives, Handbook I: Cognitive Domain. A hierarchy was proposed for each of eight topics in chemistry using the method suggested by Gagne. Each hierarchy consisted of two informational concepts, A and B, and a third concept, C, which could be obtained by synthesizing A and B. The term, informational concept, refers to that information which is generalized and learned as a concept, and which can be combined with another informational concept to synthesize a new structure or concept not clearly there before. Both the relevant subordinate capabilities in the hierarchy and the synthesis task itself were measured.

The process of synthesis was investigated by using eight units of chemistry subject matter. In each unit topic the learner was taught informational concepts A and B. A test was given to determine if the learner had acquired both A and B, and if he could successfully synthesize the two to produce C. In the first treatment group, the information was presented at separate times by providing written programmed learning material concerning A on one day, and similar material concerning B on the next day. In the second treatment group, the written programmed material concerning both A and B was given on the same day.

- 11:15** OCEANIC EDUCATION ACTIVITIES AT THE OHIO STATE UNIVERSITY  
By Dr. Victor J. Mayer, Professor of Science Education and Geology.  
1945 N. High Street, Columbus, Ohio 43210

The Faculty of Science and Mathematics Education at Ohio State has been involved in a variety of activities over the past several years relating to education about our oceans. They include involvement in the Crustal Evolution Education Project; a national effort to develop secondary school activities relating to plate tectonics; a series of workshops supported by the Columbus Council of the Navy League of the U.S. to acquaint middle school teachers with oceanic education concepts and materials, and most recently a project supported by the Sea Grant Office of the National Oceanic and Atmospheric Administration to develop curriculum materials for Great Lakes Schools. Each project will be reviewed briefly and the summer workshops described in depth.

- 11:30** OCEANIC ACTIVITIES FOR GREAT LAKES SCHOOLS (OEAGLS)  
Beth Kennedy, Research Assistant, The Ohio State University, 250 Arps Hall,  
1945 North High Street, Columbus, Ohio 43210

This project, supported by the Sea Grant Program of NOAA and The Ohio State University, develops middle school level (grades 5 through 9) instructional materials in activity packages for a variety of curricula related to oceanic studies. All materials are designed to improve student understanding of fundamental concepts and will be appropriate for use in schools located within the interior United States. Activity packages focus on the oceans and major water bodies, such as the Great Lakes and major river systems, and their role in the economic, political, social, scientific, and/or technological well-being of the United States. Packages are modularly designed for use within existing courses of study, are interdisciplinary in nature, and are designed to use equipment currently available to most teachers. Priority has been given to topics that require mental operations at the concrete level of cognitive development as defined by Jean Piaget. Once activities are successfully evaluated they will be placed in the ERIC system and will be sent to all Sea Grant Directors.

- 11:45** THE CRUSTAL EVOLUTION EDUCATION PROJECT: A PROGRESS REPORT  
Carlos Rojas C., Research Assistant, Faculty of Science &  
Mathematics Education, The Ohio State University, 1945 N. High  
Street, Columbus, Ohio 43210.

The Crustal Evolution Education Project was funded by the National Science Foundation in the summer of 1976. Ohio State University is one of the six development centers and is also the project evaluation center. Classroom materials are developed with the cooperation of a scientist, the center director, and one or more secondary school teachers. Then the materials are piloted in a secondary school and revised as necessary.

Most of the activities developed by the OSU center focused on the use of oceanic cores and Gondwana correlations as aids in reconstructing certain aspects of the continental drift theory.

During the third year the project will concentrate on a final formative evaluation of the materials and revisions of teacher's guide.

## **12:00 NOON BUSINESS MEETING**

**AFTERNOON SESSION, 2:00 P.M.**  
**Oelma 112**  
(Please join Section G. Chemistry for a joint Symposium on  
Toxic Substances in High School and College Science Laboratories.)

# I. SECTION OF ANTHROPOLOGY & SOCIOLOGY

MORNING SESSION, SATURDAY, APRIL 22, 9:15 A.M.

Millett 151

Vice President, FELICITAS GOODMAN, Presiding

- 9:15 THE WILLARD MASTODON: EVIDENCE OF HUMAN PREDATION. Russell Alan Falquet, Director, and William C. Haneberg, Project Earth Study, 507 Humiston Drive, Bay Village, Ohio 44140

During Phase I and II investigations of the Willard Mastodon burial in north central Ohio, a team of high school and college excavators uncovered the partial remains of an extinct American mastodon (*Mammuth americanum*). In conjunction with these faunal remains, a number of well-made flint tools were found. The finds support their theory that this animal was butchered by paleo-Indian hunters some 9520 years B.P. Markings on the vertebrae and a disarticulated skeleton are indicative of human involvement. With this data, a relationship between the mastodon and man the predator can now be established and will result in a greater understanding of the multiple factors involved in North American mega-faunal extinctions.

- 9:35 PEARSON VILLAGE: AN UPPER MISSISSIPPIAN SITE IN SANDUSKY COUNTY, OHIO  
Jonathan Bowen, Dept. of Archaeology, The Ohio Historical Society, Columbus, Ohio 43211

One-hundred fifty pounds of cultural remains were recovered from the surface of Pearson Village in May 1977. The inhabitants grew corn, and the main animals hunted were deer, elk, bear, raccoon, and beaver. The bone tools and ceramics suggest that Pearson Village was occupied ca. A.D. 1300 - A.D. 1450.

- 9:55 A POSSIBLE INTEGRATION OF LEE'S MODEL ON MIGRATION WITH THAT OF KAMMYER'S. Elias T. Nigem, Department of Sociology, Anthropology, and Social Work, University of Toledo, Toledo, Ohio 43606.

Systematically accumulated knowledge on migration is an essential step in the formulation of a sound sociological theory. The present paper tried to integrate Lee's model of migration with that of Kammyer's. Both models appear to have merits for explaining migration, but not adequate enough for theorizing on such a complex phenomenon. The utility of Lee's model is in its generality and inclusiveness--most studies in migration can be classified within this framework. Abstractness and inclusiveness, however, are not adequate criteria upon which to judge the strength of a particular scheme. Empirical clarity and the ability to separate the levels of analysis must be included. Lee's model does not separate the levels of analysis and does not specify particular variables. Less explanatory than Lee's model, Kammyer's theoretical framework attempts to classify the level of analysis by categorizing the effects of the family and the economy on migration. Other levels of analysis and other factors were not included. Put together, the two theoretical frameworks may reduce some of the problems they face separately.

- 10:25 A PARADIGM FOR THE SELECTION OF VARIABLES IN FAMILY RESEARCH. T. Neal Garland and David J. O'Brien. Department of Sociology, The University of Akron, Akron, Ohio 44325.

Family sociology has often been criticized for its failure to develop firm theoretical guidelines for its research. Recently, however, two important books dealing with family theory have been published by Burr (1973) and by Rogers (1973). This paper attempts to integrate the ideas of these two writers in order to arrive at a theoretical paradigm which will serve to guide the selection of variables in family research. The purpose of the paradigm will be to make investigators more aware of the necessity of taking into consideration the interrelationships of variables which fall along two important theoretical dimensions: levels of abstraction and levels of analysis. The paradigm will facilitate consideration of how variables at different levels affect each other as well as helping the researcher to be more aware of how variables omitted from the research design may nevertheless affect the outcome of the study.

- 10:45** DIFFERENCES IN THE STATUS AND ROLE OF THE ELDERLY IN MODERN AND TRADITIONAL SOCIETIES: A POSSIBLE RESOLUTION OF CONFLICTING THEORIES. Ronni Sterns, Department of Sociology, University of Akron, Akron, Ohio 44325

Much disagreement exists in cross-cultural studies concerning differences between the status and role of the elderly in modern and traditional societies. Discrepancies in findings would be fewer if the categories of "modern" and "traditional" were conceptualized less dichotomously. Rather than postulating broad cultural generalizations and universals which cannot account for all cases we could utilize Julian Steward's concept of core features of form-function in levels of sociocultural integration. Analysis of relevant variations in cultural-ecological adaptations and in historical circumstances would more accurately account for cross-cultural differences in the status and role of the elderly. Such a multivariate analysis would include at least the following variables as core features: subsistence base, technoeconomic level, type of kinship system, residence patterns, complexity of social structure, location of family power and patterns of inter-familial conflict, institutional and historical factors, cultural values, and cohort differences. The resultant theory would be more comprehensive and inclusive than any so far generated.

- 11:05** SIMULATION FOR SOCIAL ORGANIZATION  
Lyle R. Darnauer, Learning Center, Capital University, Columbus, Ohio 43209

A description and analysis of the creation of a simulation by a class in social organization. The model used as a starting point is one developed by Arlyn Melcher. A brief description is also given of the final product, which is taken as a starting point for further development by subsequent classes.

- 11:25** PROSTITUTION AS A SOCIAL DEVIANCE. Darlene Violet. Department of Sociology, The University of Akron, Akron, Ohio 44325.

A field research paper on prostitution has recently been conducted. This study looks at prostitution as a sub-cultural phenomenon. The sample consisted of twenty-five prostitutes working in the city of Dayton, Ohio. This study deals with the prostitute's childhood, family life, adolescent life experiences, introduction to the subculture of prostitution, and current values and self-concept. Findings revealed the prostitute's self-concept was extremely good. A comparison study was then done with waitresses paying special attention to their self-concept. It was found the sample of prostitutes scored higher on the self-esteem test than the waitresses but scored lower on the social adjustment test.

**11:45 A.M. BUSINESS MEETING**

**AFTERNOON SESSION, 2:00 P.M.**  
**Millet 151**  
**Vice President, FELICITAS GOODMAN, Presiding**

- 2:00** ETHNICITY, HEALTH, AND DISEASE. Lynn Clough. Department of Sociology, The University of Akron, Akron, Ohio 44325

There is an abundance of medical articles describing ethnic variations in rates of disease. These articles are used to (1) guide physicians and nurses in diagnosis and treatment of certain ethnic groups; (2) make physicians and nurses more aware of the prevalence of diseases within certain groups of peoples; (3) teach a better understanding of the ethnic culture involved so as to better institute health care facilities; and (4) point to some of the possible etiologies of diseases to be further investigated.

This study is a survey of 85 research articles showing ethnicity to be related to disease and utilization of health care facilities that were published in 47 journals from January 1970 to July 1977. Content analysis was used to identify the patterns of methodology used and theory applied in those articles. Ethnicity was examined as a variable and attention was focused upon the definition of a specific ethnic group, how it was measured and how it was operationalized in each study. This was done in order to ascertain the actual value of the studies for insights into etiology. Other variables examined through the content analysis were the authors' specialization and their source of funding. Methodology was examined in view of sampling composition and techniques, study design and time span. The theoretical perspective was analyzed with special attention focused upon whether the theory was related to any ongoing body of sociological theory. Finally, each article was analyzed for any recommendations made for health care improvements for particular ethnic groups.

## ANTHROPOLOGY & SOCIOLOGY

- 2:20** AGENCY RESPONSES TO FAMILY VIOLENCE. David Bass and Janet Rice, Department of Sociology, The University of Akron, Akron, Ohio 44325.

Each year an estimated 1.8 million wives are beaten by their husbands. Wife abuse, as well as child abuse, has only recently begun to attract the attention of researchers. The limited research available indicates that institutional response to the abusive family may be a major factor explaining why the abused wife remains with her spouse. To investigate this possibility, interviews were conducted with selected employees of 20 social service agencies likely to deal with abuse cases in Summit County, Ohio. The interviews were designed to locate factors viewed by the agencies as being related to family violence and to identify types of advice the agencies give to abused wives, as well as to determine how agency policies affect the continuation or cessation of violence within the home.

- 2:40** IN THE WAKE OF A FLAGSHIP: SOME PROBLEMS TO CONSIDER. Ms. Velma Pomrenke, 25 Thompson Drive, Akron, Ohio, 44313

Increasingly evaluation components are becoming integral parts of social programs. Since most programs funded publicly or privately are not inexpensive, there is pressure to justify these considerable expenditures by measuring their effectiveness for the organization effected by the program. This paper reports the evaluation activities of the W.K. Kellogg Program for the Development of Team Leadership at an Urban University at The University of Akron, January, 1976 to February, 1978. The University of Akron was selected by the Kellogg Foundation to serve as a flagship for university leadership training throughout the nation.

Problems identified by the evaluation activities were: the creation of parallel participation structures within the organization; perceived elitism of the participants; creation of expectations by the participants and the implications of such expectations for the organization; and the difficulties of social program evaluation. Based on these experiences, suggestions are offered which might ameliorate such problems, given similar programs at similar institutions.

- 3:00** THE RESURGENCE OF A SOCIAL MOVEMENT: DEMOCRATIC SOCIALISM IN 1978  
John M. Mecartney, Sociology Department, Mercy College of Detroit,  
8200 W. Outer Dr., Detroit, MI 48219

A major social movement devoted to reducing stratification and democratizing the economy has revived after twenty years of quiescence. The primary expression is the Democratic Socialist Organizing Committee (DSOC). Indications of renewal include: (1) Prominent people joining DSOC from academia, labor, religion, civil rights, feminism, and politics (including one congressperson and a Democratic candidate for governor. (2) The acceptance of DSOC as part of the left wing of the Democratic Party currently pressuring the president to fulfill his campaign promises. (3) The increasing openness of the American people to new solutions to the energy, unemployment, and inflation crises. (4) Growing interest in worker controlled industries--a traditional thrust of democratic socialism. (These include the plywood industries of the Northwest, the Vermont Asbestos plant, and now Youngstown Sheet and Tube Co.--the latter receiving \$300,000 from HUD. In 1975 a national poll indicated a plurality of Americans favored worker control of industry.) (5) The growing prominence of the charismatic leader of DSOC, Michael Harrington, who is also a prolific writer. (6) The emergence of two new democratic socialist publications, IN THESE TIMES and MOTHER JONES. (7) The New America Movement is born.

- 3:20**      **ARCHAEOLOGICAL EVIDENCE OF THE EARLIEST USE OF RAW COAL IN AMERICAN IRONMAKING**  
 John R. White. Dept. of Soc/Anthro    Youngstown State University  
 Youngstown, Ohio 44555

According to most historical records available, the Eaton (Hopewell) Furnace in Struthers (near Youngstown) Ohio was built in 1802-03 and went out of blast about 1812. Until now its principal claim to historical or technological note has been its identification as the earliest blast furnace west of the Allegheny Mountains. Archaeological excavations carried out in 1975 and 1976 and subsequent metallurgical analysis of the recovered artifacts and materials reveal that the Eaton's lasting importance lies in its pioneering use of bituminous coal in combination with charcoal as a reducing fuel in ironmaking. The finding of an abundant amount of bituminous raw coal in the furnace tippie area is sound primary evidence of its use in the furnace charging process. Metallurgical analysis of the various materials recovered from the site substantiated this. X-ray fluorescent analysis of the finished cast iron and slag revealed the presence of sulfur in levels which could not be accounted for in any of the materials making up the furnace charge e.g. kidney ore, charcoal, and limestone, where only a trace of sulfur was found; only the bituminous raw coal could have supplied such amounts of sulfur. Conclusion- the use of coal in combination with charcoal at the Eaton (Hopewell) Furnace occurred decades earlier than at any other blast furnace site in the New World.

- 3:40**      **THINKING ABOUT THE HARD LINE ON CRIME CONTROL.**    Stephen B. McConnell, University of Toledo, Dept. of Sociology, Anthropology and Social Work, Toledo, Ohio 43606.

The paper sees a shift from the traditional U.S. commitment of rehabilitating criminal offenders. The changing attitude is explained theoretically as part of a pattern of change in American social and political ideology. Liberal and conservative positions concerning crime and its control are assessed. A brief history of the study of criminality and penology entails with special attention to Beccaria. It is argued that James Q. Wilson's Thinking About Crime is a reversion to the classical school of criminology. The social, economic and political impact of increasing crime, the acknowledged failure of rehabilitation, and the black uprising of the 1960's are seen as compelling an atmosphere uncomfortable for traditional liberalism. The result is that liberalism is abandoning the reform ethic. Liberal theory about criminality and its reduction have become untenable. Liberal thought has accepted the medical model of disease which is rejected by social structural explanations of crime. Liberal analysis is often inconsistent with sociological understanding of crime. The trend of sending fewer to prison (more use of probation), prevailing since 1962, has been reversed. More are being incarcerated. The Committee for the Study of Incarceration composed of generally liberal thinkers called for an end to parole. Professor Dershowitz of Harvard Law School recommends punishment because its deserved--not in hopes of rehabilitation. In January, 1978 the U.S. Senate approved a bill which would phase out parole. The conclusion is drawn that the U.S. will become more punishment oriented.

- 4:00**      **THE CASKET SELECTION PROCESS: THE FUNERAL DIRECTOR'S VIEW.**  
 Dolores Mysliwiec, The University of Akron, Sociology Department,  
 Akron, Ohio 44325.

This ethnographic study concentrates on one aspect of the funeral -- the casket-selection process. Existing literature places emphasis on the views of the bereaved. This study presents the funeral director's view of this process. Data revealed that funeral directors utilize an unspoken typology of clients, the money conscious, the do-it-to-me's, the good relatives and the blamers. Through interviews, a typology of funeral directors was formulated on a business-service continuum. A funeral director's position on this continuum reflects his professional style of performance. His position effects the entire casket-selection process, from the decor of the arrangement room to the treatment of the bereaved. Definite themes operate in the various segments of the process. The theme of "homey comfort" dominates the interaction and setting of the arrangement segment, "protection" and "buy within your means" highlights the actual selection segment of the process. These themes prevail throughout the sample of funeral directors, but the manner in which they are presented is effected by the funeral director's business-service orientation.

## CONSERVATION

# J. SECTION OF CONSERVATION

MORNING SESSION, SATURDAY, APRIL 22, 9:00 A.M.

Oelma 125

Vice President, M. C. MARKHAM, Presiding

**9:30** RECLAMATION OF STRIPMINE SPOILS. Paul Sutton, 16714 SR 215, Caldwell, Ohio 43724

Reclamation research has been conducted on the revegetation of toxic coal mine spoils. The toxicity results from the oxidation of pyrites to produce sulfuric acid and soluble salts. Studies have been conducted to determine the rates of limestone required to neutralize the acidity. On a highly acid spoil material limestone applied at the rate of 31 tons per acre did not neutralize enough acidity for plant establishment. Sewage sludge rates as high as 294 tons per acre have been applied to spoils with a pH of 2.4 for plant establishment. Good plant growth has been obtained. Power plant fly ash has been applied at rates as high as 750 tons per acre for revegetating barren spoilbanks. A good vegetative cover has been established.

Rates of nitrogen, phosphorus and potassium have been applied to forages growing on spoils to determine fertilizer requirements for good production. Significant yield responses were obtained with 50 and 100 pounds per acre of nitrogen.

**9:55** LAKE HOPE -- WHITHER OR WITHER Brant, Russell A., Senior Geologist and Acting Head, Coal Section, Kentucky Geological Survey, University of Kentucky, Lexington, Kentucky, 40506, and Huntsman, Brent E., Hydrogeologist, Assistant to the Director, Brehm Environmental Laboratory, Wright State University, Dayton, Ohio, 45435

Construction of Lake Hope was completed in 1939 by the Resettlement Administration in cooperation with the Division of Forestry. Nearly coincident with that construction was the increased development of small scale mining in the feed waters of the Lake on Sandy Run. The acceleration of mining and its continuation through World War II were reflected in Lake Hope as drastically depressed water quality. Many concerns, ideas, plans, and efforts have been advanced, especially since 1948, but few are manifest for permanent attenuation of the condition. The 1950's were marked by considerable mining development and increasing interest in lime and limestone treatment of the Lake's waters. In the 1960's, the Ohio Department of Natural Resources purchased mining properties outright to provide barrier protection and unencumbered access to the mines of Sandy Run for future remedial construction of indefinite nature. Fundamental research, detailed exploration of mines, and inquiry was advanced into pyrite oxidation. In the 1970's, the Lake area was caught up in a resurgence of interest with gob pile removal and consultation centering the activities. Many persons of varied skills and disciplines have had an active hand in study of the area or attempts at remedy. The site has proven to be popular for study and contemplation and has inspired basic and sound concepts, but little in the way of action scaled to the problem.

**10:30** PRESERVING OHIO'S NATURAL HERITAGE Richard E. Moseley, Jr., Natural Areas and Scenic Rivers Planning Section, Ohio Department of Natural Resources, Fountain Square, Columbus, OH 43224 and Robert M. McCance, Jr., Ohio Natural Heritage Program, 1500 Dublin Rd., Columbus, OH 43215

Today only a few remnants of Ohio's natural features remain relatively unspoiled. These unique natural areas are becoming increasingly more valuable and yet more vulnerable. To preserve this heritage, a State Nature Preserve system was established when the Ohio Natural Areas Act became law on August 31, 1970. The goal of the program is to establish a system of nature preserves throughout the state which possesses exceptional value or quality in illustrating or interpreting the natural history of the state. Since the beginning of the Natural Areas Program in 1970, the system of preserves has grown to a total of 39 areas, 32 of which are dedicated, encompassing 8,348 acres. Contained within this system are outstanding geological features, stable ecological communities, habitat of rare and endangered species, relict flora and fauna, and areas of scenic grandeur.

To efficiently meet the need for a comprehensive natural areas inventory, the Ohio Department of Natural Resources established in cooperation with The Nature Conservancy a Natural Heritage Program in Ohio. This program is essentially designed to classify and collect natural areas data and to provide a systematic, quick retrieval, computerized basis for identifying ecologically significant areas, communities, species and features. As of January 1, 1978, 5,238 different occurrences of plant and animal species, sites, and geological features have been recorded, classified and filed in the system.

**11:15 A.M. BUSINESS MEETING**



## CONSERVATION - GENETICS & CELL BIOLOGY

**AFTERNOON SESSION, 1:30 P.M.**  
**Oelman 125**  
**Membership Chairman, JOSEPH KASILE, Presiding**

### RESEARCH, EDUCATION AND MANAGEMENT OF NATURE CONSERVANCY NATURAL AREAS IN OHIO.

**1:30**

Grace M. Lieberman, Regional Land Steward. The Nature Conservancy,  
328 East Hennepin Avenue, Minneapolis, Mn. 55414.

During the last five years, The Nature Conservancy has been directing strong efforts toward developing management and use plans for its preserves throughout the United States. Since the early days of The Nature Conservancy, our preserves have been utilized for educational programs, research and passive recreation programs. It is one goal of the Conservancy's Stewardship Program to combine research, educational programs and passive recreation in such a manner as to make each activity an intricate part of the stewardship program for each natural area. During 1977 and 1978 we have been able to progress toward the achievement of this goal with the assistance of the Institute of Environmental Education of Cleveland, Ohio. During this presentation, I will introduce you to a brief history of Conservancy management and use programs, especially in Ohio; discuss the present Conservancy Program in Ohio; and, the need for the continuation of such stewardship programs on natural areas in Ohio and throughout the United States.

### DEVELOPMENT OF THE NATURE CONSERVANCY'S STUDENT STEWARDSHIP PROGRAM

**2:15** Thomas W. Offutt, Institute for Environmental Education, 8911 Euclid Avenue,  
Cleveland, Ohio 44106

The Institute for Environmental Education is a non-profit Ohio Corporation that has designed a number of programs which involve secondary school and college students in research projects which develop data of value to regulatory and conservation agencies. The data is useful to the agency and the educational experience of significant value to the students. This paper summarizes these programs with emphasis on the Ohio Heritage Program developed for the U. S. EPA and the Student Stewardship Program developed for The Nature Conservancy and includes details on organization, materials, and funding.

## K. SECTION OF GENETICS & CELL BIOLOGY

**Saturday, April 22, 11:30 A.M.**  
**Fawcett 210**  
**Vice President, HAROLD LEE, Presiding**

Genetics papers this year are being presented in Zoology and in the Poster Session. See papers by Lamvermeyer and Matschke and Gregg in afternoon Zoology Section. Also see poster presentation by Garabis and Paddock.

**11:30 A.M. BUSINESS MEETING**

## L. SECTION OF MATHEMATICS & COMPUTER SCIENCES

MORNING SESSION, SATURDAY, APRIL 22, 9:00 A.M.

Fawcett 206

Vice President, DON M. M. BOOKER, Presiding

SPECIAL SYMPOSIUM: Multi-attribute Decision Theory

9:30

DECISION ANALYSIS FOR ENVIRONMENTAL MANAGEMENT: AN APPROACH TO CHOICES AMONG MULTIATTRIBUTE ALTERNATIVES WITH INTANGIBLE COSTS AND BENEFITS. R. S. Brockwehl, S. B. Friedman, and A. E. Harvey. Institute of Environmental Sciences, Miami University, Oxford, Ohio 45056.

Environmental policy decisions tend to involve choices among multiattributed alternatives with intangible costs and benefits. Federal guidelines for natural resource management prescribe a multiobjective approach to decision analysis. Furthermore, the objectives are often conflicting, especially when diverse interest groups are affected. Flow diagrams and classification charts help the decision maker choose an appropriate model to fit his unique decision problem. Two models for a hypothetical decision problem are discussed: (1) the multiple-attribute, single-objective model which is solved by linear programming, and (2) the multiple-objective model which is solved by goal programming. Multiattribute utility theory is used to quantify the models. Decision theoretic techniques can be used to deal with risk and uncertainty. In case an optimal solution is infeasible or undesired, the information generated by the models can be presented to the decision maker in the form of profiles. Concepts such as cost effectiveness and aspiration level can be used to compare the alternatives. The problem of defining broad goals in terms of specific objectives can be approached with the use of goal hierarchies. The aim of the paper is to present techniques which are easily applied by the environmental manager, yet firmly grounded in theory. Examples of application are given throughout.

10:00

APPLYING A VECTOR-VALUED DECISION MODEL IN THE SOCIAL SERVICE FIELD  
S. B. Friedman, Ph.D., P.E., J. L. Gahris, B.S., and A.E. Harvey, Ph.D.  
School of Applied Science, Kreger Hall, Miami University, Oxford, Ohio 45056

A modeling technique is presented which enhances rational decision making when considering future options. It is being applied in a social service field which includes a substantial portion of intangible benefits and costs. Previous methods have attempted to quantify intangibles arbitrarily, and have faced serious limitations as a result. This new technique, however, deliberately maintains the separation of tangibles and intangibles, which are represented by a two-dimensional vector space. As a consequence, the decision maker must use decision rules to find a tradeoff between the two vectors. For objectivity, Bayesian statistics are used in a decision tree. For consistency, eigenvectors are used in pair-wise comparisons to determine the weights of various components of a "quality of life" scale. This is then applied to the decision tree by means of indifference curves. The vector-valued technique has been previously applied to a machine design problem, and is now proving its usefulness by optimizing the decisions for home health aide and home-maker service.

10:30

THE CYCLICAL MAJORITY PROBLEM AND MULTIATTRIBUTE DECISION THEORY.  
D.M.M. Booker, Dept. of Systems Analysis, Miami University, Oxford, OH.

A brief review of the cyclical majority problem will be presented. The formulation due to Pomeranz and Weill is restated as an integer programming problem. This formulation is shown to provide an equivalent representation for group decision problems, over single and multiple attribute decision spaces, and individual decision problems over multiattribute decision spaces. The use of a common multiattribute decision model to characterize prices, technologies, cultures, communities, coalitions, and politics is shown to be possible. Some advantages and disadvantages of such a model are discussed. Some implications of an effective equivalence of the cyclical majority problem and individual multiattribute decision problems are discussed.

## MATHEMATICS & COMPUTER SCIENCES

**11:00** A PARADIGM FOR COMPUTER SCIENCE. Leone E. Winslow, Computer Science Department, Wright State University, Dayton, Ohio 45435.

Computer Science, like every other discipline, has a number of paradigms; some (such as structured programming) are unique to itself, and others (such as automata theory) are shared with other disciplines. The general impression, however, is a grabbag of tricks and techniques, each applicable to only a small set of problems. This talk will present a paradigm with a number of levels of power and sophistication. The levels are integrated such that at no level does a student have to unlearn methods developed earlier, nor, in the mind of the sophisticated user, is there any doubt as to which level suffices to solve a given problem.

**11:30 A.M. BUSINESS MEETING**

**AFTERNOON SESSION, 2:00 P.M.**  
**Fawcett 206**  
**Membership Chairman, BRAITHWAITE, Presiding**

**2:00** MODELING OF TRANSPOSITION ERRORS  
James J. Houdeshell, P.E. 338 Lonsdale Ave. Dayton, Ohio 45419

In many inspection or manufacturing operations, it is necessary to repeatedly transcribe numbers from a readout device to a written record. During this type of operation, errors were made once every 500 units when transcribing a four digit number. It was hypothesized the error mechanism was the transposition of the ten's and one's digits. These errors could produce incorrect weight adjustments ranging from 81 to -81 theoretical grams assuming that the part weights were uniformly distributed from XX00 grams to XX99 grams. In actuality, the empty containers were normally distributed with a mean of 2658 and a standard deviation of 7 grams. The distribution of the resulting errors given the input of normally distributed weights was determined by simulation. The direct method of normal random number generation was chosen. The transposition errors were generated and tabulated with the resulting frequency noted. This data was favorably compared with actual errors.

**2:20** FIRE SAFETY IN APPLIED SCIENCE AND ENGINEERING, Benjamin Koo, Ph.D., P.E., Professor in Civil Engineering, The University of Toledo, Toledo, Ohio 43606.

A scientifically oriented system approach with application of engineering principles to achieve fire safety objectives, i.e. life safety, structural integrity and optimum economy is presented. The system consists of concepts of detection, compartmentation and suppression. Proper maintenance and correct interaction among systems and sub-systems insure success in operation. Analytical structural responses are predicted by modeling of fire environment and characteristics of building materials subjected to elevated temperatures. Simplified formulas have been derived for easy calculation deterministically and probabilistically. The cost effectiveness criteria are investigated according to the amount spent balanced by risk reduced. The search of an optimum point depends upon the size of the building, probability of fire occurrence and safety factors used in design calculations.

## MATHEMATICS & COMPUTER SCIENCES

- 3:15** IMPROVEMENT OF DEMAND LOAD OF ELECTRIC UTILITIES HAVING SOLAR HEATING CUSTOMERS. Adel H. Eltimsahy, Richard G. Molyet, University of Toledo, Toledo, Ohio 43606.

One of the anticipated consequences of the shifting availability of natural energy sources is a trend toward more solarly heated homes with electric energy as the auxiliary source. This is true since solar heating systems do require an auxiliary heat source in most locations of the United States. The auxiliary source of energy is most likely to be electric due to the unavailability of natural gas in many growth areas and the uncertainties of the oil supply. However, uncontrolled growth of domestic electric energy consumption for heating, air conditioning and water heating could have ill effects on the overall energy picture of this country.

This paper focuses on the impact of using solar energy for domestic space heating systems that utilize off-peak storage on the electric power network. The methodology used is that of digital computer simulation of an existing system on the campus of The University of Toledo (the system uses Libbey-Owens-Ford's flat plate solar collector).

The effects of these systems on a northwestern Ohio electric utility are evaluated. Plots of the new demand curves and load factors are presented. The curves presented are for different values of: number of houses in the area utilizing these systems, heat pump size and off-peak storage period. This paper is also concerned with the application of the systems approach in order to find a suboptimal controller which minimizes conventional electric energy usage, uses electric energy at times when its cost is low and maximizes human comfort. Results of computer simulations show that the formulated controller achieved the above design objectives.

- 3:35** TRAVELING LOADS ON THE TIMOSHENKO BEAM. Peter J. Torvik, Professor of Mechanics, Department of Aeronautics and Astronautics, Air Force Institute of Technology, Wright-Patterson Air Force Base, Ohio 45433.

A transverse force traveling along an infinite string or beam at critical values of constant velocity generates unbounded amplitudes, in the absence of dissipation. This resonance is analogous to the unbounded amplitudes generated by a stationary force oscillating at one of the natural frequencies. The response of a finite elementary beam to a moving force of constant amplitude can be determined in terms of the eigenfunctions of the beam by elementary methods. Modification of elementary beam theory to take into account the effects of rotatory inertia and shear deformations leads to the Timoshenko beam theory, from which a new set of eigenvalues and eigenfunctions may be determined. These eigenfunctions can be shown to have an orthogonality relationship which, although unusual, permits the solution of initial value and non-homogeneous problems. The procedure for solving such problems is given, and applied to the problem of a traveling load on a finite Timoshenko beam with arbitrary end conditions. Results are obtained for the case of pinned ends, and compared with those from the elementary theory. Results of particular significance are that the distribution of critical speeds is altered significantly through inclusion of rotatory and shear effects, and that a shear wave, not present in the elementary theory, can be identified and shown to play a major role in determining the response.

# M. SECTION OF PSYCHOLOGY

MORNING SESSION, SATURDAY, APRIL 22, 9:00 A.M.

Fawcett 208

Vice-President, ROBERT DEITCHMAN, Presiding

9:30

USING STUDENT RECORDS FOR TEACHER-DECISIONS TO IMPROVE READING IN CONTENT AREAS. James W. Langer, 390 Fair Street, Berea, Ohio 44017; Dr. Robert Ferguson, Akron University, Akron, Ohio 44309.

- oTo identify reading needs
- oTo share prediction process for use by teachers
- oTo "match" student needs and materials
- oTo use school records for classroom decisions

The problem of this study was to analyze data in students' school records - sex, father's occupation, school attendance, entrance age, IQ score, achievement test scores, and teachers' assessments - in order to develop predictive equations and forms for predicting reading achievement and for designing instructional assistance as early as possible. Multiple linear regression identified criterion variance for individual, combinations of, and covaried variables; thus classroom methods, materials, and time could be "matched" with this range of predicted reading scores/needs, from remedial to gifted.

Four major findings were identified: 1) prediction equations were developed as early as the kindergarten year and for use through the primary grades; 2) the most significant predictors were teachers' assessments, achievement sub-test scores, and IQ scores; 3) reading prediction equations and forms were designed for use in the classroom by the classroom teachers; and 4) this process used available school records for more objective instructional decisions and was transferable to most school systems.

10:30

DEVELOPMENT OF THE ALPHA-OMEGA COMPLETED SENTENCE FORM: A PREDICTOR TO MEASUREMENT, IDENTIFICATION, AND ASSESSMENT OF DEATH STRESS AND RELATED TOPICS. Klein, R. J., LaCamera, J., Newman, I., & Weis, D. M.; The University of Akron, Akron, OH 44325.

After reviewing a number of studies related to the topics of death and dying, the investigators believed that it would be helpful for members of the helping professions to be able to effectively measure, identify, and assess an individual's "Adaptational Approach(es)" to the knowledge of his/her dying and death, or the knowledge of a significant others' (parent, child, spouse, friend, etc.) dying and eventual death. With this objective in mind, the Alpha-Omega Completed Sentence Form (AOCSF) was constructed to measure and identify important psychological "Adaptational Approach(es)" persons might take to stressful events such as the possibility of one's dying and impending death. At this time, three preliminary studies have been conducted in the process of developing the AOCSF. The following statistical procedures have been utilized to examine the AOCSF: (1) Cronbach's Alpha Internal Consistency, (2) Pearson Product Moment Correlation (test-retest), and (3) dependent t-Tests to examine differences between the five psychological constructs. In addition, two expert judges have taken the 50-item AOCSF and classified the item responses into pathological or non-pathological response scores.

10:45

SYSTEMATIC EVALUATION OF INSTRUCTION. Ralph F. Darr, Jr. & David J. Robison, The University of Akron, Akron, OH 44325

Sixty-four undergraduate educational psychology students were studied to determine the relationship between their performances on a ten-item demographic survey, a 75-item pretest, a 34-item course evaluation questionnaire and ten 24-item weekly mastery quizzes. The quizzes were highly interrelated ( $r=.41$  to  $.74$ ). Sixty of 430 (13.9%) correlations between demographic variables and quizzes were significant ( $r=.25$  to  $.51$ ). "Grade received in general psychology" (32 out of 50, or 64%), "academic rank" (7 out of 50, or 14%), and "grade expected" (14 out of 40, or 35%) accounted 88.3% of the significant correlations between demographic data and quizzes. The pretest was related to all ten quizzes ( $r=.40$  to  $.52$ ). Fifty-eight of 340 (17.0%) correlations between the end-of-course student evaluation and quizzes were significant ( $r=.25$  to  $.48$ ). The student evaluation form contains four clusters of items: (I) Objectives -- 4 items, (II) Instructional Procedures -- 19 items, (III) Tests and Evaluation -- 7 items, and (IV) Overall Evaluation -- 4 items. Fourteen of 40 (35.0%) correlations between (I) Objectives and quizzes were significant ( $r=.25$  to  $.49$ ). Thirty-nine of 190 (20.5%) correlations between quizzes and (II) Instructional Procedures were significant ( $r=.25$  to  $.38$ ). Eighteen of 70 (25.8%) correlations between (III) Testing Procedures and quizzes were significant ( $r=.28$  to  $.48$ ). None of 40 correlations between (IV) Overall Course Ratings and quizzes were significant.

## PSYCHOLOGY

**11:00** MAIPRACTICE OF THE INTERPRETATION OF STATISTICAL ANALYSIS. John W. Fraas and Isadore Newman; Ashland College, Ashland, Ohio 44805; The University of Akron, Akron, Ohio 44325.

Four problems that researchers may confront when interpreting statistical research results were examined in this paper. First, a discussion was presented concerning the problem that gain scores tend to become unreliable as the correlation coefficient value between the pretest scores and the posttest scores approaches the test reliability value. Second, a discussion was presented concerning the conditions under which the probabilities of committing a Type I Error or a Type II Error changed when analysis of covariance was utilized. Third, the relationship between the problem of multicollinearity and the degree to which the results can be generalized was investigated. This discussion centered on the importance of the existence or absence of disproportionality in the population. Finally, the difference between the interpretation of research results analyzed by part correlation as compared to partial correlation was presented.

## 11:15 A.M. BUSINESS MEETING

### AFTERNOON SESSION, 1:30 P.M.

Fawcett 208

Membership Chairman, ISADORE NEWMAN, Presiding

**1:30** AN EXPERIMENTAL STUDY OF THE REMEDIATION OF DEFICIENCIES IN AUDITORY PERCEPTION--Irvin, Geraldine H., Ph.D. & Hoedt, Kenneth C., Ph.D., Department of Counseling and Special Education, Room 127 Carroll Hall, The University of Akron, Akron, Ohio.

Auditory perception in studies reporting a relationship between auditory perception and reading achievement has been generally defined in terms of the ability to discriminate. The definition of auditory perception proposed by Lerner (1971), which incorporated auditory memory, auditory sequential memory, and auditory blending, along with auditory discrimination, provides the theoretical basis of the present study. Auditory training procedures dictated by Lerner's definition were introduced into five kindergarten classes. Five no-treatment classes were included as control groups.

The criterion variables included four subtests of the ITPA: Auditory Reception, Auditory Sequential Memory, Auditory Closure, and Auditory Association; the Rosner Auditory Analysis Test, and the Self-Concept and Motivation Inventory. Analysis of differences between experimental and control groups was accomplished by means of Multiple Linear Regression.

Results concerning the effects of the training program on auditory functioning as measured by the ITPA indicated growth only at the meaningful level of language usage. The ability to analyze words as measured by the Auditory Analysis Test also showed significant improvement. The effects of the auditory training program on reading readiness and the self-concept were encouraging, showing significant differences between the experimental and control groups, favoring the treated group.

**2:15** A QUANTITATIVE MEASURE OF SKILL FOR OLDER WOMEN. Dr. Gary L. Rupp, Assistant Professor of Industrial Engineering, The University of Toledo, Toledo, Ohio 43606.

A "critical" tracking task, developed by manual control theorists, was used to test the ability of older women to control an increasingly unstable system. As the system becomes more unstable, the task gets more difficult. The amount of instability at which control is lost serves as the performance measure.

Nine women in each of two age groups, 50-59 and 60-69 years, performed the task over a two day period. On each day the trials were arranged into 4 blocks of 7 trials each. Preliminary results indicate that the younger age group was able to control a more unstable system. Practical implications will be discussed.

- 2:30** PATERNAL BEHAVIOR AT INITIAL CONTACT WITH THE NEONATE IMMEDIATELY FOLLOWING BIRTH  
Darrell L. McDonald, 3565 Malley Street, Akron, Ohio 44319

Species-specific and characteristic behaviors at initial contact with their young have been documented in nonhuman female and male primates, and human mothers. This investigation questioned if fathers might also exhibit a discernibly stable and characteristic behavioral repertoire at initial neonate contact. In the same home-like birth environment, the postpartal behaviors of seven fathers were video-taped via remote control cameras. Seven repetitiously exhibited behaviors were quantified by trained observers, utilizing a continuous flow, slow-motion video technique. The first nine minutes of neonate-oriented paternal behavior were compared across three consecutive, three minute intervals immediately postpartum. All fathers exhibited an identical sequence in the emergence of neonate contact behavior: First contacts were made with the tips of the fingers; later, palmar contact was exhibited. During the initial three minute interval, fathers exhibited hovering behavior 81%, visual contact 77%, prolonged gazing 60%, face-to-face behavior 36%, and shooting behavior 38%. Analysis of the data suggests that initial neonate-oriented paternal behavior is stable, emerges sequentially and is significantly different from the repertoire exhibited subsequently. Ethological, experimental, and clinical observations suggest that initial contact behavior reflects the paternal psychological engrossment with the neonate, and appears functional in establishing the paternal-neonate affectual bond.

- 2:50** EMPLOYEE REACTIONS TO THE 4-DAY WORKWEEK: A LONGITUDINAL STUDY. Richard A. Page, Joseph L. Balloun, and Leslie Melamed, Department of Psychology, Wright State University, Dayton, Ohio 45435.

During two recent summers, all employees at a midwestern university were placed on a four-day 40 hour workweek. In order to examine employee reactions to the four-day week, a longitudinal study was conducted in which questionnaires were distributed to all employees prior to the initial implementation of the four-day week, at the end of the first summer, and at the end of the second summer. Significant changes in reaction occurred across time, with employee attitudes being significantly more positive prior to the implementation of the four-day week than following its implementation. Significant differences were also found between the three different categories of employees (classified staff, unclassified staff, and faculty), with classified staff (hourly employees) responding most favorably to the four-day week at all three points in time and faculty (salaried employees) responding least favorably to the four-day week at all three points in time. While a majority of employees felt that the four-day week provided an increase in recreation time, significant increases were reported in fatigue and loss of sleep, and significant decreases were found in job satisfaction and in productivity and efficiency. There was also a strong feeling, particularly among hourly employees, that the 10 hour per day schedule resulted in a high proportion of working time which was wasted or used ineffectively. The results suggest that caution should be exercised by organizations considering shifting to a four-day week, and that such organizations should be aware of possible changes in employee reactions to the four-day week following its implementation.

- 3:05** THE EFFECTS OF STRENGTH AND DIRECTION OF PERFORMANCE EXPECTANCY ON ATTRIBUTIONS REGARDING THE CAUSES OF SUCCESS AND FAILURE. Richard A. Page, Richard H. Miller, and Martin K. Moss, Department of Psychology, Wright State University, Dayton, Ohio, 45435.

It was hypothesized from cognitive consistency theory that test performances consistent with ones expectancy will tend to be attributed to internal sources of cause (ability and effort), while performances inconsistent with ones expectancy will tend to be attributed to external sources of cause (luck and task difficulty). It was also hypothesized that the magnitude of these effects would increase as the strength of the expectancy increased. A study was conducted in which individuals were led to believe that they had either high or low ability on a perceptual judgment task. After performing the task, in which their performance was either consistent or inconsistent with their expectancy, they were asked to make judgments regarding the causes of their performance. As predicted, subjects whose performance was consistent with their expectancies attributed their performance more to internal sources of cause than did subjects whose performance was inconsistent with their expectancies. This effect was found for subjects with strong expectancies, but not for subjects with weak expectancies. The results were viewed as offering support for cognitive consistency theory.

## JUNIOR ACADEMY

# N. JUNIOR ACADEMY SECTION

MORNING SESSION, SATURDAY, APRIL 22, 10:00 A.M.

Millett 118

Vice President, JOSEPH HOFFMAN, Presiding

### 10:00 A.M. BUSINESS MEETING

#### SIGNAL MULTIPLEXING FOR OPTICAL FIBER COMMUNICATION

10:15

C. Robert Pearsall II  
136 W. Elm St.  
Deshler, OH 43516

The purpose of this research was to construct an optical fiber communication link and to study the applicable multiplexing methods.

The communication link was designed, constructed, and found to work fairly well, although receiver noise was a significant problem which remains to be completely overcome. Digital transmissions were much easier to receive than were analog transmissions, showing the importance of digital modulation of analog signals for transmission.

A A source/fiber coupling system was designed for LED's and plastic fibers which was very effective.

The applicable multiplexing methods have been divided into two basic types: multiplexing onto electromagnetic and onto physical carriers. The minimum sampling rate for speech, if it is to be digitally modulated, is about 1500 Hz., and, if not, it is about 3000 Hz. Spectral multiplexing was found to be non-feasible with materials available to this author.

10:30

#### INCREASING THE EFFICIENCY OF EXCISION REPAIR IN UV-IRRADIATED ESCHERICHIA COLI. Shawn C. Berry, 6905 Elaine NW, North Canton, Ohio 44720

The cells of higher living organisms possess mechanisms capable of repairing minor damage to molecular DNA. One particular system, operating between cellular divisions, is known as excision repair. Incorporating a number of enzymes and a large degree of chemical activity and transport, this system requires a great deal of energy to function. Accordingly, it was assumed that an increase in available energy would significantly increase the efficiency of the excision repair process. In demonstrating this, varying concentrations of glucose (a source of readable energy) were placed in the medias of UV-irradiated Escherichia coli AB 1157. The strain being thymine requiring, the level of repair of ultra-violet induced pyrimidine dimers was measured by the uptake of thymidine (methyl-<sup>3</sup>H). Upon taking beta counts in a liquid scintillation spectrometer, it was found that the DNA of the glucose cultured bacteria had incorporated six times the amount of thymidine over the bacteria without glucose. Comparisons of the controls showed that these results could not be accounted for by normal DNA replication or an increase in metabolic activity. Higher concentrations of glucose failed to increase the rate of repair over lower concentrations, implying that only a limited amount of glucose can be utilized in a given period of time. The over-all conclusion was that glucose application was solely responsible for the increased efficiency in the excision repair process, with an upper effective limit of approximately 0.05 percent concentration.



10:50

THE EFFECTS OF 3-METHYLCHOLANTHRENE ON RAT LIVER mRNA  
Rachel Jarvis 3866 St. Rt. 14, Rootstown, Ohio 44272

There are three types of cellular RNA. Ribosomal RNA which is involved in ribosome structure, transfer RNA which carries a specific amino acid to a ribosome and messenger RNA which is an intermediate between the cells genetic information and its expression into protein. Obviously, mRNA is of considerable biological interest and significance. One way of understanding the action of mRNA in vivo would be to investigate its action in vitro. If an in vitro cell-free protein-synthesizing system could be devised and programmed by exogenous RNA to make protein, many questions of fundamental importance could be studied. The most popular system is derived from wheat germ. This system has several distinct advantages which include availability and low cost of starting material, high translational efficiency, and low endogenous mRNA.

The liver mRNA used for the experiments was obtained from rats treated with either corn oil or corn oil containing 3-methylcholanthrene, a known carcinogen. Total RNA was prepared from rat livers using a phenol/chloroform extraction. The mRNA was isolated from the total RNA by affinity chromatography then translated using the wheat germ system. One of the 20 amino acids (leucine) was radioactive and protein synthesis was followed by measuring the incorporation of  $^3\text{H}$  leucine into hot acid insoluble protein.

The translational efficiencies of the two mRNA populations will be compared under conditions optimized for total protein synthesis. Any differences found may be relatable to the early effects of 3-methylcholanthrene on rat liver.

11:05

HYDROGEN-FUELED TRANSPORTATION. John Dunlap, Senior Student in Engineering & Project Leader, The University of Toledo, Toledo, Ohio 43606.

Hydrogen is a fuel which is virtually limitless in supply, but has yet to be tapped. It is attractive as a fuel of the future primarily because it is ecologically clean when burned. When hydrogen gas combines with air, water vapor is formed and the only pollution by-products of the combustion are small amounts of nitrous oxides.

Although hydrogen engines have been around for a long time, their operation has been difficult to control because of problems with knock and backfire due to characteristics of hydrogen as a fuel. Recent developments, such as water injection have helped control these problems so the engine can be run smoothly and efficiently. Several students from the University of Toledo are modifying a vehicle to use hydrogen as a fuel. The vehicle, a VW microbus, has its engine modified to use a gaseous fuel and also has water injection to control backfire.

Storage of the hydrogen is accomplished through the use of metal hydrides. Hydrides are metals which can absorb and release hydrogen much like a sponge and water. Whether or not the hydride absorbs or releases is dependent on the temperature of the hydride. Exhaust gases are the primary source of heat for the hydride. Complete monitoring of the system will be accomplished through use of a microprocessor. The microprocessor will be connected to flow, temperature and pressure sensors and will display the recorded values. This will allow safe and efficient operation of the hydrogen bus. The need for an alternate fuel for transportation becomes more apparent everyday. Hydrogen is a logical choice because of its abundance and non-polluting nature. However, hydrogen technology is still new and needs active research and support to make it possible.

#### Special Notice

Additional papers are planned but were not received in time to meet the printing deadline for this program. Check at the Registration Desk for an expanded Program.

A special program is planned by this Section starting with a Reception at the Holiday Inn, Fairborn on Friday evening, April 21, 1978 and ending with a field trip and box lunch on Sunday April 23, 1978. Write for Special Registration Forms to: The Ohio Academy of Science, 445 King Avenue, Columbus, Ohio 43201 or phone (614) 424-6045.

## O. SECTION OF ENGINEERING

Fawcett 240

Vice President, JAMES FARISON, Presiding

Section O will not meet in session except for a  
Business Meeting. Papers will be presented in other sections.

11:30 A.M. BUSINESS MEETING

### D. Medical Sciences

INTERACTION OF MEDICINE AND ENGINEERING IN EGYPT by Herman R. Weed

COMPUTER PROCESSING OF ELECTROCARDIOGRAPHIC SIGNALS by Subhash C.  
Kwatra

ABSOLUTE MEASUREMENT OF THE FUNDAMENTAL CHARACTERISTICS OF  
ULTRASONIC FIELDS by Michael O'Shea

PROBLEMS IN ASSESSING THE SAFETY OF DIAGNOSTIC ULTRASOUND by David A.  
Rice, Herman R. Weed and L. A. Swiger

CLINICAL USE AND EVALUATION OF A VISUAL VOCODER AS A TEACHING AID  
FOR THE DEAF by Richard M. Campbell, Brian K. Cosens and Herman R. Weed

### E. Physics and Astronomy

A COMPARISON OF TWO DIFFERENTLY SLOPED BACKGROUNDS IN RELATION TO  
A STATIONARY OWENS-ILLINOIS SUNPAK SOLAR ENERGY COLLECTOR by  
Bradley Fintel

### L. Mathematics and Computer Sciences

IMPROVEMENT OF DEMAND LOAD OF ELECTRIC UTILITIES HAVING SOLAR  
HEATING CUSTOMERS by Adel H. Eltimsaky and Richard G. Molyet

TRAVELING LOADS ON THE TIMOSHENKO BEAM by Peter J. Torvik

FIRE SAFETY IN APPLIED SCIENCE AND ENGINEERING by Benjamin Koo

MODELING OF TRANSPORTATION ERROR by James J. Houdeshell

### M. Psychology

A QUANTITATIVE MEASURE OF SKILL FOR OLDER WOMEN by Gary L. Rupp

### N. Junior Academy

HYDROGEN-FUELED TRANSPORTATION by John Dunlap

### P. Administrative Sciences and Planning

ENGINEERS AND SCIENTISTS COUNCIL OF OHIO by Lloyd A. Chacey

# P. SECTION OF ADMINISTRATIVE SCIENCES & PLANNING

MORNING SESSION, SATURDAY, APRIL 22, 9:00 A.M.

Millen 124

Vice President, JAMES COWDEN, Presiding

## SUBURBAN INTEGRATION AND COMMUNITY SATISFACTION

9:00

Charles Funderburk & Paul C. Shaw  
Wright State University  
Dayton, Ohio 45435

This paper reports attitudes, perceptions and behaviors of black migrants to a suburb that was all white prior to 1970. Reported are motives for moving into the suburb; experiences with realtors and mortgage lenders; the level of satisfaction with public services, public safety, schools and social life; resident definitions of what constitutes both an "integrated community" and "integrated schools" (including acceptable levels of racial population mix); anticipations/expectations regarding the community's future; and prospects for community stability.

## THE IMPACT OF INTERMETROPOLITAN MIGRATIONS ON URBAN POLICY FORMULATION

9:25

Edward W. Hanten, Director, Center for Urban Studies, The University of Akron, Akron, Ohio 44325

This paper analyzes the relationships between intermetropolitan migrations of both population and economic activities and the formulation of urban policy in the United States. This research examines the magnitude of this interregional shift and identifies its cumulative effects on the various urban regions, identifies major urban policy issues involved, and explores the feasibility of evolving urban actions and policies in meeting the new metropolitan realities in the United States. The philosophical issues to be considered are whether the new geographic configuration of urban America reflects a national failure, a normal historical trend, or merely social and economic adjustments which portend long-term benefits for all urban regions.

## CITIZEN PARTICIPATION IN URBAN PLANNING: THE GOALS PROGRAM

9:50

Frank J. Kendrick  
The University of Akron  
Akron, Ohio 44325

Over the past decade, a number of U.S. cities have launched goals-setting programs, through which citizens have been encouraged to become directly involved in planning for the long-range development of their communities. The theory behind this new approach to planning is this: if a community can develop widespread, prior agreement upon desirable goals, it should also be able to implement these goals without the usual group conflict that accompanies most urban policy-making. But can this model of planning actually be accomplished? This paper describes in detail the program in Akron, Ohio, and also summarizes the findings of research on a number of other, similar programs.

If followed through a complete cycle, the goals-setting process consists of ten stages, from the initial decision to set goals, through implementation and monitoring, to starting with a new set of goals. The outstanding problems include: (1) defining citizen participation; (2) phrasing the goals in operational terms; (3) maintaining a sustained commitment to the program; (4) developing sufficient citizen interests; and (5) financial shortages. Given the problems, it is difficult to pass final judgment. But this approach to planning deserves more experimentation and effort, because the objective of encouraging citizen involvement is felt to be highly desirable.

## ADMINISTRATIVE SCIENCES & PLANNING

10:20

### HOW REPRESENTATIVE ARE MANDATED CITIZEN PARTICIPATION PROCESSES?

Steve Redburn, Steve Foster,  
William Binning, and Terry Buss  
Center for Urban Studies  
Youngstown State University  
Youngstown, Ohio 44555

Federally mandated citizen participation processes have proliferated in recent years. There are reasons to doubt whether such participation accurately communicates public opinion to decision-makers. The policy preferences of participants in such processes are compared with those of a representative public sample and local elected and appointed officials.

10:45

### THE IMPACT OF INTERGOVERNMENTAL RELATIONS ON LOCAL LAND USE POLICY DECISIONS

William R. Mangun  
Department of Urban Studies  
The University of Akron  
Akron, Ohio 44325

Traditionally, the responsibility for making land use policy decisions has been assigned to local governmental officials. In recent years this position has changed remarkably. First, the federal government began to erode local responsibility with the passage of grant-in-aid legislation with "strings" attached. In order to receive the money, local officials had to abide by certain regulations. This can be readily seen in the HUD 701, EPA 201 and 208, EDA, CZM planning requirements. More recently, state governments, desiring more uniformity in growth patterns, increasingly have enacted land use controls. With this increase in federal and state requirements, the ability of local officials to determine local land use patterns has diminished. This study draws upon information from three different states in an attempt to illustrate the intergovernmental network web of land use policy decision-making. Standards, characteristics of implementing agencies, important actors, environmental conditions, and other variables are examined.

11:15

### ENGINEERS AND SCIENTISTS COUNCIL OF OHIO, Lloyd A. Chacey, P.E., Engineers Foundation of Ohio, 445 King Avenue, Columbus, Ohio 43201

This paper will present the need for and the purpose of a Council of Engineers and Scientists on the statewide level. We will discuss the relationship of the Council to state and local government as well as the people it is designed to

serve.

The basic theory is that the quality of life in a state or a community can be improved in a more orderly and positive manner if there exists a Council of Engineers and Scientists, independent of the government. The Council would systematically meet and compare notes in an effort to present its publics with as near as possible consensus opinions rather than the one-sided opinions of either group as is now the case.

11:30 A.M. BUSINESS MEETING

AFTERNOON SESSION, 1:30 P.M.

Milllett 124

Membership Chairman, STEVEN REDBURN, Presiding

SPECIAL SYMPOSIUM: Energy Policy Development

1:30

ELECTRIC UTILITY DEMAND FORECASTS: THE ROLE OF STATE GOVERNMENT  
David C. Sweet, Commissioner, Public Utilities Commission of Ohio  
180 East Broad Street, Columbus, Ohio 43215

One of the major challenges facing the electric utility industry is that of assuring sufficient capacity to meet demand growth while maintaining reserve margins at reasonable levels. A major part of this challenge is the development of demand forecasts which are sensitive to the rapidly changing economic conditions in which the industry operates. There is little coordination within state agencies or between state government and public utilities in the preparation and review of electric energy demand forecasts. The new Ohio Department of Energy is charged with state energy planning, but the Power Siting Commission must determine the "need" for future energy facilities. Also, the Public Utilities Commission must approve financing for utility expansions which are being constructed to meet the forecasted growth in demand. This fragmentation of responsibility is not conducive to the orderly development of demand forecasts and expansion plans, acceptable to the utility, state energy and regulatory officials and the public. Basic legislative changes are needed to reduce the potential conflict and confusion. One approach would be the further separation of energy planning and regulatory functions in state government. Forecasts prepared by the utilities, Department of Energy and other groups would be subject to review and certification following a public hearing before the Public Utilities Commission. State agencies would then be required to use the adopted forecasts in future energy planning or regulatory functions.

2:00

ENERGY POLICY AND THE LEGISLATIVE PROCESS IN OHIO  
James W. Cowden, Center for Urban Regionalism, Kent State  
University, Kent, Ohio 44242 and Mimi Becker,  
Environmental Policy Associates, Hiram, Ohio 44234

The energy crisis which surfaced during the oil embargo of 1973 found the state of Ohio without an energy policy and without an institutional focus or capacity for the development of such a policy. The energy problem is viewed, not as an emergency requiring executive action, but as a basic structural and social problem to be worked out in the legislative process. This case study reports the development of an energy bill by the authors, beginning with the problem analysis, research elements and the interrelationships with the sponsoring legislators and legislative technicians. The institutional condition and constraints are identified, including the federal initiatives for state energy planning. The basic philosophy and criteria that guided the writing of the bill included the need for a public presence in what was largely a private process. The responsibility of the legislature for policy issues and the impact of the legislative process on the bill after its introduction are discussed. Major revisions and additions to the bill that eventually became the vehicle for establishing the Ohio Department of Energy are outlined, together with the rationale for the amendment process.

2:25

THE ENERGY CRISIS AND THE NEW-BREED OF REGULATORS: A STUDY OF PUBLIC UTILITY COMMISSIONS. Thomas M. Pelsoci/B. James Kweder. The Department of Political Science, Cleveland State University, Cleveland, Ohio 44115.

Growing environmental concern and the energy shortages of the 1970's have led to the rapid upgrading of state public utility commission memberships. The "new breed" of commissioner was far better educated than the regulators of the 1960's, was younger and had less political and business experience. Although these tendencies were discernible at nearly every state PUC, there was considerable regional variation in the extent of educational upgrading and the nature of prior experience. Differences in salary levels did not appear to be important contributing factors. Rather, most of the variation seemed to be associated with the method of commissioner selection (by election or appointment), potential for influence and prestige, and opportunities for activism.

## ADMINISTRATIVE SCIENCES & PLANNING

2:40

### INTERGOVERNMENTAL ENERGY POLICY LINKAGES IN THE UNITED STATES

William R. Mangun  
Department of Urban Studies  
University of Akron  
Akron, Ohio 44325

Most recent discussion of the "energy crisis" has focused on the exigencies of technical solutions and the reorganization of federal agencies responsible for energy policy formulation. Little discussion has been carried on over the network of intergovernmental policy linkages which will be necessary for the implementation of a national energy policy. Granted, the national government formulates our energy policies, for all intents and purposes, but state and local governments are ultimately responsible for the implementation of federal policies as well as their own. It is with this in mind, that I will carefully analyze existing and projected energy policy linkages between federal, state and local governments. For example, the states are assigned specific responsibilities under federal legislation to formulate "state energy plans." But, as is the case for "state implementation plans" under the Clean Air Act, local governments will be assigned specific functional responsibilities for the implementation of those state energy plans. In this paper, I will address the interrelationships between the three basic levels of government and the roles each is likely to play in the formulation and implementation of a national energy policy.

3:05

### FEDERAL POLICY ON NATURAL GAS PRICING: THE IMPLICATIONS FOR OHIO

John L. Moore  
Academy for Contemporary Problems  
1501 Neil Avenue  
Columbus, Ohio 43201

Approximately thirty percent of Ohio's annual energy consumption is natural gas. The majority of this gas comes from interstate shipments, with the price regulated by the Federal Energy Regulatory Commission. This paper explores the short and long run implications for Ohio of emerging Federal policy on natural gas prices. The economic arguments for and against regulation of the wellhead price of natural gas are briefly examined in terms of resource allocation and long run economic efficiency. Using alternate scenarios on possible future price regulation, the paper examines effects on: the strength of incentives for exploration and production in the state; the long run access Ohio has to gas production from the major producing states; and the strength of incentives for Ohio business and residents to conserve fuel. The paper concludes that Ohio's long run interests will be better served by Federal policy which allows a more direct role for market forces in natural gas pricing.

3:30

### PLANNING FOR COMMUNITY ENERGY SYSTEMS. Janice L. Gott, Miami University 3 East Spring Street, Oxford, Ohio 45056

Considering that a switch to renewable energy sources will be necessary in the future, thought should be given to the methods by which energy-providing systems could be governed. In many cases, community-sized energy systems may prove to be the most efficient scale of operation. Such a system could feasibly be governed by the community itself, as a democratic cooperative effort. The increased participation that would be necessary would cause some shifts in sociological trends that should be taken into consideration when planning community systems. More responsibility for decision-making increases the personal commitment of time and risk necessary to obtain energy. The benefits of the system must be able to outweigh these detractions, and there is evidence that they may do so. A feeling of control over one's own life is a positive product of a truly democratic energy system. A cooperative, rather than individualistic, spirit would be necessary to facilitate group decision-making, but would result in a sense of belonging and collective accomplishment. Various tradeoffs are possible between independence and dependence in governing community systems. The values that the participants placed on their time, risk, individualism, etc., would determine the optimal system of government for them. The development of community governments for energy systems will need to take into account these values and needs as well as more conventional considerations of practicality.

## Q. SECTION OF ECONOMICS

MORNING SESSION, SATURDAY, APRIL 22, 8:30 A.M.

Millett 125

Vice President, GARY STACEY, Presiding

SPECIAL SYMPOSIUM: Strategies for Economic Development in Ohio.

- 8:30** COMPARISON OF OHIO OUT-MIGRANTS WITH IN-MIGRANTS AND RESIDENTS 1965-70  
John Treacy and Barbara Denison, Wright State University, Dayton, OH 45435

This paper represents the second part of a larger study designed to assess the effects of migration on the Ohio economy. Specifically, this paper will present the characteristics of out-migrants from Ohio, compare these characteristics to those of the Ohio residents and in-migrants, and draw appropriate conclusions. Characteristics of in-migrants to Ohio and Ohio residents were tabulated by the author. All data pertaining to Ohio in-migrants and residents are taken from this source.

- 9:15** ECONOMIC DEVELOPMENT OF RURAL OHIO Leroy J. Hushak, Dept. of Agricultural Econ.,  
The Ohio State University, Columbus Ohio 43210

Few rural communities can remain economically viable as service centers for agriculture. Many are attempting to increase their non-agricultural employment base. Complementing these efforts, the population reversal beginning about 1970 has resulted in larger populations for many rural communities. Based on Ohio Bureau of Employment Services data, from 1973 to 1976 total covered employment increased by eight percent in non-SMSA counties. Manufacturing employment declined by nine, ten, and six percent, respectively, in Ohio, SMSA, and non-SMSA counties, while Services employment increased by 10, 10, and 12 percent, respectively. The major advantage of rural areas is a low skilled labor force willing to work at low wage rates. A second advantage of many rural Ohio communities is excess capacity for water, sewer, and other community services. Rural communities are likely to be the major beneficiaries of current Ohio strategy to attract branch manufacturing plants. However, several critical issues face rural areas. First, many rural communities will continue to experience large resource extraction or branch plant developments. How can the "boom or bust" economies generated by these developments be mitigated? Second, conventional wisdom suggests large public investments such as industrial parks are needed to attract industry. Many rural communities will have difficulty raising the needed capital. Are there alternatives? Third, many rural communities are overly dependent on manufacturing employment. How can the financial and other incentives needed to stimulate firms in high growth areas be developed?

- 10:00** PROBLEMS AND PRACTICES OF URBAN DEVELOPMENT: A CASE STUDY OF CINCINNATI  
Saul Pleeter, Manpower Services Division, City of Cincinnati,  
Cincinnati, Ohio 45203

Economic activity in the major central cities of Ohio is declining; this decline having intensified with the recession of 1975. While the forces influencing this decline have been in effect for at least two decades, only recently has economic development been pushed as a solution in many of these cities. Few cities have systematically examined the source of their problems, the external constraints placed upon various initiatives that are being proposed or realistically appraised their needs and potential. In fact, the remedial effect of economic development is probably grossly overestimated in many areas. Few cities have the institutional mechanisms to implement an economic development plan and lack the resources to start one. Finally there is a question as to whether cities should be planning for growth or possibly contraction, an issue that many cities avoid.

Although this paper examines these issues for the City of Cincinnati, much of this discussion is applicable to other cities in Ohio.

## ECONOMICS

10:45

POLICY CONSTRAINTS FACING OHIO FARMERS D. Lynn Forster, Dept. of Agricultural Economics, The Ohio State University, Columbus, OH 43210

Some Federal and state policies have helped U.S. agriculture become the world's most efficient food production system. Those policies have included our land grant system which produced a relatively egalitarian social structure within agriculture; a Land Grant College system which changed the concept of education and fostered technological innovations; soil conservation programs that protected our nation's soil and water resources; a Farm Credit System which assured access to capital markets; grading and inspection programs which informed and protected consumers; and commodity price and storage programs which protected the farmer from the price risks inherent in the biological process and stored food for later use in years of shortages. At the same time, some of our Federal, state, and local government policies are said to be constraining our food system. The purpose of this discussion is to point out a few of the external forces impinging on agricultural producers and to examine their effects upon the performance of these producers. The first set of forces is Federal and state regulatory constraints directed at labor and the environment. The second set of forces is Federal and state tax structures facing farmers. These include income taxes, estate taxes, and property taxes. The third set of forces are the result of the urban and rural interface in a community in which policy decisions such as land use planning and roading construction may affect the use and ultimate value of agricultural land.

## 12:00 Noon BUSINESS MEETING

AFTERNOON SESSION, 1:00 P.M.  
Millett 125  
Vice President, GARY STACEY, Presiding

1:00

THE PRACTICE OF ECONOMIC DEVELOPMENT IN OHIO  
Wilford L'Esperance, Department of Economics, The Ohio State University

This paper consists of a review of the practices of economic development in Ohio with respect to promoting economic growth. How well do economic developers address themselves to the problems of the Ohio economy. How successful are developers and their strategies in reversing the relative decline of the Ohio economy to U. S. economy. Answers to these questions are given with emphasis on the practices of state government.

It is found that economic development practices in Ohio are generally ill-developed and misdirected. Suggestions are given for improvement.

1:45

OHIO'S NEW TAX INCENTIVE LAWS Robert M. Stutz  
Dept. of Economic & Community Development  
30 East Broad St., Columbus, Ohio 43216

Within the last year, three new significant state laws have been enacted that are designed to provide local governments with alternative programs with which they can attract private investment in housing, commercial and industrial projects. Since this state enabling legislation is often passed as "special purpose" legislation for one specific project, many communities do not become aware of such state enabling tools which can be utilized by any municipality, or in some cases, counties also.

The Office of Local Government Services within the Ohio Department of Economic and Community Development has assisted many villages, cities and counties with understanding these new tools and implementation projects. In a growing number of cases, investors want to know what tax incentive measures can be included into the package to encourage their decision. These packages are then compared between communities in the same state and between communities in other states.

The new simplicity and local control elements that are part of these new programs have resulted in smaller municipalities and counties participating in such incentive programs for the first time.



## 2:30 TAX POLICY AND STATE ECONOMIC DEVELOPMENT

Frederick D. Stocker, Professor  
 Department of Economics  
 Ohio State University  
 1775 South College Road  
 Columbus, Ohio 43210

State tax policy no doubt affects economic development, but there is no agreement on what specific features of a tax system are favorable to economic development or how strong their influence is. This paper is in three parts. The first reviews what existing research can tell us about the role of tax differentials, fiscal incentives and other features of state revenue structures on economic development, drawing largely on a soon-to-be published study by The Academy for Contemporary Problems. The second part examines the present Ohio tax structure, noting the various features that may be favorable or unfavorable to economic development. The third looks at various policy options through which our state tax structure might be modified to encourage more rapid economic growth.

3:15 FINANCING INDUSTRIAL DEVELOPMENT IN OHIO Richard T. Taliaferro  
 Air Force Institute of Technology, AFIT/LSCR, Wright-Patterson AFB OH 45433

Ohio, along with other upper midwestern states faces the bleak prospect of a continuing trend of relatively declining capital investment by manufacturing firms.

Over the last fifteen years a steady erosion in the state's capital base has taken place. This is reflected in the significant decline of manufacturing employment from about 40 percent of total employment in 1960 to about 30 percent in 1975. In the meantime, population growth has come to a virtual standstill due to ongoing migration of people to the more attractive job markets that the flight of capital has provided elsewhere. Ohio cannot compete head to head with the sunbelt in terms of labor and construction costs, climate or changing market proximity. Consequently it must seek other avenues to forestall further deterioration of capital investment by manufacturing firms. There appear to be opportunities for Ohio to encourage investment by more imaginative use of financing inducements. In this respect, as analyzed in this paper, Ohio differs from neighboring states in its approach to municipal bond financing as well as venture capital.

## R. SECTION OF ECOLOGY

MORNING SESSION, SATURDAY, APRIL 22, 9:00 A.M.

Bio Sci 105

Vice President, GARY BARRETT, Presiding

## 9:00

### THE EFFECT OF A HYPOLIMNETIC ALUMINUM SULFATE TREATMENT ON THE PELAGIC MICROCRUSTACEA OF THE TWIN LAKES

G. Dennis Cooke and Donna N. Myers. Department of Biological Sciences, Kent State University, Kent, Ohio 44242

A maximum dose ( $140 \text{ M}^3$ ) of aluminum sulfate (alum) was applied to the hypolimnion of West Twin Lake (WTL) (Portage Co., Ohio) in 1975 to control internal phosphorus loading. An adjacent and very similar lake, East Twin (ETL) was left as an untreated downstream control. To assess the impact of treatment on the microcrustacean community, the composition of summer pelagic samples taken in 1969 (Heinz, 1971) was compared to samples taken in 1976. WTL in 1976 had fewer species than ETL in 1976 and WTL in 1969 ( $p < .05$ ), and had lower Simpson species diversity in 1976 than ETL in 1976 or WTL in 1969. Coefficient of Community and Percent Similarity (Whittaker and Fairbanks, 1958) between the lakes were much lower in 1976 than in 1969. Causes of the observed changes are not known since the alum dose left no detectable residual dissolved aluminum in the water, and the amount added was designed to be 6X below acute and 78X below chronic toxicity to *Daphnia magna* (Biesinger and Christensen, 1972). Changes in the phytoplankton after treatment, differences in predation, and the "blanket" of aluminum hydroxide floc may be among the factors involved.

## ECOLOGY

9:15

THE EFFECT OF A CHELATED COPPER ALGICIDE ON THE PRODUCTIVITY OF A SMALL, OHIO POND  
Donna N. Myers and G. Dennis Cooke. Department of Biological Sciences, Kent State University, Kent, Ohio 44242

The effects of applications of Cutrine, a broad range chelated copper algicide, on the planktonic and total community productivity of an experimental and adjacent control pond were investigated from April through September, 1977 (Suffield Twp., Portage Co., Ohio). Phytoplankton, mat-forming metaphyton, and non-target, submergent, vascular macrophytes were found in the ponds. Applications were made on 30 May, 21 June, and 20 September. After application, P/R ratios decreased then generally increased by the tenth day after treatment. Control pond P/R ratios fluctuated around one in May and June but dropped below unity from July through September. Experimental pond P/R ratios were less than one prior to the second treatment, then exceeded one from July through August. Regrowth of algae after the May application resulted from a bloom of *Hydrodictyon* sp.; after the second treatment, *Euglena* sp. was responsible for increased algal productivity. Phytoplankton contributed a larger proportion to community productivity after treatments in the experimental pond than in the control. Total phosphorus measured 24 hours post-treatment revealed 3 to 4 fold increases, while control pond concentrations were unchanged. Each Cutrine treatment stimulated a new succession in the pond, perhaps through the nutrients released from the decaying vegetation.

9:30

PATTERNS OF NUTRIENT AND SEDIMENT TRANSPORT IN AGRICULTURAL/URBAN WATERSHEDS OF NORTHWESTERN OHIO. David B. Baker and Jack W. Kramer, River Studies Laboratory, Heidelberg College, Tiffin, Ohio 44883

The fluvial transport of suspended sediments, total phosphorus, soluble orthophosphorus, nitrates and chlorides has received detailed study in 12 large (170 to 3200 KM<sup>2</sup>) agricultural watersheds with varying extents of point source inputs. Automatic sampling equipment at stream gaging stations has been used to obtain 4-12 samples per day during runoff events and single samples on non-event days. From 1000 to 3000 samples per station have been analyzed. Graphs of concentrations versus streamflows for each station reveal patterns that reflect the extent and/or proximity of point source inputs and the presence of nonpoint source inputs. At stations a short distance downstream from significant point source inputs, concentrations of both total and soluble orthophosphorus increase with decreasing stream flow within the low ranges of stream flow. Due to instream phosphorus deposition, this effect decreases as the downstream distance from the input to the sampling station increases. For strictly agricultural watersheds, both ortho- and total phosphorus concentrations remain relatively low and fairly constant within the low flow ranges. In all of the watersheds total phosphorus and sediment concentrations increase with increasing stream flows in the mid- and high flow ranges but show large variations at a given flow. Combined sewer overflows, erosion associated with intense summer thunderstorms, and snow melt events all yield data which deviate in characteristic ways from the above general patterns. Nitrate concentrations are highly variable and show little relationship to stream flow.

9:50

ECOLOGY OF THE HIPPOLYTID SHRIMP, *BARBOURIA CUBENSIS* (VON MARTENS) ON SAN SALVADOR ISLAND, BAHAMAS. H. H. Hobbs III. Department of Biology, Wittenberg University, Springfield, Ohio 45501.

On 2 December 1977 the first female specimens of the anchialine shrimp *Barbouria cubensis* (von Martens) were collected from a "Blue Hole" in the southwestern part of San Salvador Island, Bahamas. The brackish pool (salinity 13.1 ppt), a solutional feature developed within carbonate bedrock approximately four meters above sea level, was oval in shape, 25 by 40 m. The walls of the sinkhole extended approximately one meter above the water's surface; at the margin the water was only 0.5 m deep. The bottom descended steeply to a much deeper central area and consisted almost entirely of a thick deposit of pelecypod, *Polymesoda maritima* (Orbiguy) and gastropod [*Batillaria minima* (Gmelin), *Cerithidea costata* (daCosta) and *Melampus* sp.] shells which were covered by a thin layer of detritus. The green alga, *Batophora oerstedii* J. Agardh was scattered over the bottom and the fishes, *Cyprinodon variegatus* Lacepede and *Gambusia puncticulata manni* Hubbs, were observed in greatest numbers in the littoral zone; no aquatic macrophytes were present. The air and water temperatures were 31.1 and 27.9°C, respectively, at 11:00 A.M. The shrimp were quite numerous, the greatest abundance occurring about 3 m from shore, where some 15 to 20 individuals per m<sup>2</sup> were concentrated. The brightly colored orange shrimp actively moved across the substrate, periodically pausing, sometimes near clumps of the alga, only to resume their multi-directional path of wandering.

10:00

THE EVALUATION OF A LENGTH LIMIT ON LARGEMOUTH BASS (*MICROPTERUS SALMOIDES*) AND AQUATIC VEGETATION CONTROL AS FISHERY MANAGEMENT TECHNIQUES AT ROSS LAKE, CHILLICOTHE, OHIO. Gary L. Isbell and Bernard L. Griswold. Ohio Cooperative Fishery Unit, 1735 Neil Ave., Columbus, Ohio 43210.

A 14 inch (355 mm) length limit on largemouth bass, as well as aquatic vegetation control were investigated as management techniques at Ross Lake, Chillicothe, Ohio. Mortality and growth changes of largemouth bass (*Micropterus salmoides*) and bluegills (*Lepomis macrochirus*) were determined. Angler surveys revealed that in 1977 the bass length limit reduced harvest of bass and decreased total mortality. Removal of aquatic vegetation during the summer months reduced cover for small bluegills, allowing increased bass predation and growth. Our tentative projection is that future gamefish population structure at Ross Lake will be favorable for increased harvest of larger bass and bluegills.

10:10

THE ECOLOGY OF BENTHIC FISH IN THE HEADWATERS OF THE BIG DARBY CREEK, OHIO. Alan J. Hosmer, Dept. of Biol. Sci., B.G.S.U., Bowling Green, Ohio 43403

Sympatric populations of eight species of darters (*Perciformes: Percidae*) and one species of sculpin (*Cottidae*) inhabit creek headwaters. Fish were sampled quantitatively to establish associations between species abundance and selected physical parameters, densities of benthic invertebrates, and the abundance of aquatic vegetation. Three species of darters were too rare to permit detailed analyses. *Etheostoma caeruleum* was the most abundant and widely distributed species, preferring fast current and large-textured substrate. *Cottus bairdi* reached maximum abundance in habitat with large-textured substrate and rapid, shallow waters. *E. blennioides* was found predominantly in third order waters and areas of dense aquatic vegetation. In contrast, *E. spectabile* occurred almost exclusively in first order waters. *E. flabellare* was associated with benthic invertebrates. *E. nigrum* was most abundant in deep waters. Associations between the densities, as well as sizes (SL) of fish species pairs were examined. *E. caeruleum* was positively associated with most co-inhabiting species of fish. In contrast, *E. nigrum* was negatively associated with most species. *C. bairdi* exhibited little association with other species. The distributions and abundances of *E. caeruleum* and *C. bairdi* are regulated primarily by the availability of habitat. Suitable habitat and food resources are available for *E. blennioides*, *E. flabellare*, and *E. spectabile*, however the abundances and distributions of these species are apparently restricted. *E. nigrum* appears to be a peripheral species. The results indicate that competition, either past or present, has probably influenced the structure of this community.

10:25

THE PSAMMIC ROTIFERA OF AN ACID MINE POLLUTED STREAM. Wayne A. Evans, Department of Zoology, Ohio University, Athens, Ohio 45701

The psammic Rotifera often dominate the meiofaunal communities of acid mine polluted streams. A stream presenting a gradient of the complex of environmental pollutants arising from acid mine waters was studied in the fall and winter of 1977. Sediment cores were taken from each of seven sites along the stream gradient. Each core was divided into 1 cm intervals representing depths of 0-1, 1-2, and 2-3 cm and placed in numbered jars. Rotifers were extracted by serial decantation with 1% MgCl<sub>2</sub>, preserved in formalin, and tallied by species using multiple whole Sedgwick-Rafter cell counts. Water samples were collected at each site and analyzed for pH, conductivity, alkalinity, Mn, Fe, and sulfates. Preliminary results show mean densities ranging from 8 to 68 rotifers per 10 cm<sup>2</sup> surface area with 95% in the top 1 cm. A total of 12 species has been identified with *Trichotria tetractis* (Ehrenberg) comprising 60% of all individuals. A significant correlation ( $r = -0.48$ ,  $P = 0.05$ ) was found between the total number of rotifers and non-carbonate conductivity. This research was supported by a grant from the U. S. Department of Interior --Ohio Water Resources Center.

## ECOLOGY

10:40

COMPOSITIONAL VARIATION AND ORDINATION OF MACROINVERTEBRATE COMMUNITIES OF THE GREAT MIAMI RIVER SYSTEM. David C. Beckett. Department of Biological Sciences, University of Cincinnati, Cincinnati, Ohio 45221

The macroinvertebrate communities of the Great Miami River system (southwestern Ohio) were studied over a wide range of environmental conditions and stresses. Stations ranged from relatively undisturbed locations to areas subjected to flood control modification, power plant thermal discharges, municipal sewage treatment plant discharges and industrial wastewater outfalls.

Similarity indices and subsequent polar ordination showed that river passage through the city of Dayton did not prohibit high biotic similarity between some sites below Dayton and undisturbed upstream locations. Stations showed varying patterns of affiliation (based on similarity indices) which correlated well with changes in river discharge. Two types of faunal homogeneity were apparent; during relatively high river discharge periods a high degree of faunal similarity occurred between far upstream and far downstream stations; during low flow conditions a biotic homogeneity was evident among all downstream stations as a result of the maximization of pollutional influences and the subsequent domination of euryecious species. Ordination of stations during high flow conditions did not produce an ordering along any gradients. During low flow conditions, however, stations ordered well along a gradient of pollutional disturbances. Pollutional effects seemed to overwhelm the effect of normal environmental variables on faunal composition during these low flow conditions.

11:00

ANNUAL CYCLE OF BACTERIOPLANKTON GROWTH IN A DIMICTIC EUTROPHIC LAKE David E. Kilchenman and Robert T. Heath, Dept. Biological Sciences, Kent State University, Kent, OH 44242.

A preliminary bacterial survey of East and West Twin Lakes (Portage County, Ohio) was done between February 1977 and March 1978. Water was collected at 1 week intervals from the 0.1, 2, 4, 7, and 10 meter depths and plated according to Standard Methods. Total colony forming units  $\text{ml}^{-1}$  were determined from colonies formed on plate count agar. Gram negative colony forming units  $\text{ml}^{-1}$  and coliform colony forming units  $\text{ml}^{-1}$  were determined on eosin-methylene blue lactose agar. Direct counts were not made. Following thermal stratification bacterial numbers increased rapidly at all depths. During the stratified season bacterial numbers were greatest in the epilimnion and least at the bottom of the thermocline. Numbers ranged from  $10^1$  CFU  $\text{ml}^{-1}$  in late spring to  $10^6$  CFU  $\text{ml}^{-1}$  in July.

10:15

STATE-SPACE SYSTEMS ANALYSIS OF PHOSPHORUS DYNAMICS IN A EUTROPHIC LAKE. Robert T. Heath, Dept. Biological Sciences, Kent State University, Kent, Ohio 44242; and Institute of Ecology, Athens, GA 30602.

Previous work has shown that appearance of adaptively produced alkaline phosphatase corresponded with a decrease in phosphomonoesters dissolved in eutrophic lake water and with an increase in the potential productivity and standing crop of the blue-green alga producing the enzyme. A non-linear model has been constructed from these findings to account for the flow of phosphorus from orthophosphate and phosphomonoesters to phytoplankton and zooplankton. Similarity between the nominal behavior of the model and field observations indicated the potential value of the model. Sensitivity analysis indicated the possible significance of zooplankton activities to phytoplankton growth. Analysis of the model also suggested that concentration of organic phosphates may serve as a significant indicator of the state of the lake ecosystem.

11:30 A.M. BUSINESS MEETING

AFTERNOON SESSION, 1:30 P.M.  
 Bio Sci 105  
 Membership Chairman, JOHN OLIVE, Presiding

1:30

A MODEL PREDICTING POPULATION GROWTH OF LABORATORY CULTURES OF DAPHNIA MAGNA AS A FUNCTION OF FOOD AVAILABILITY. Inge Buenning, University of Toledo, Department of Biology, Toledo, Ohio 43606

A model was developed which predicts various attributes of laboratory populations of Daphnia magna as a function of food availability. Combining food availability, initial density and time, the model estimates the finite birth rate, death rate, age of first reproduction, life expectancy, net reproductive rate and intrinsic rate of natural increase as a function of food supply per Daphnia day.

Food levels did not affect generation time, which remained relatively constant. At high food levels, the finite death rate is constant (0.013), the average life expectancy approaches 77 days and the average age of first reproduction is seven days. The birth rate and net reproductive rate do not reach a finite limit within the experimental food levels tested and the intrinsic rate of increase appears as a convex function of food availability. Since (1) all parameters tested except generation time are a function of food availability and (2) the model estimates of these attributes are significantly correlated with observed values, food availability can be used to predict population attributes of laboratory cultures. The model's applicability to natural zooplankton populations facing daily as well as seasonal fluctuations in food availability needs to be tested.

1:45

AN ECOLOGICAL STUDY OF CLADONIFORM LICHENS IN GRASSLAND AREAS, CONDUCTED IN RELICT AND SECONDARY PRAIRIE AREAS IN ADAMS COUNTY, OHIO. Ann Margaret Fovargue, Botany Department, Miami University, Oxford, Ohio 45056.

The role of lichens in permanent grasslands was studied on 120 replicate quadrats located on four small areas at Lynx Prairie and on a secondary hillside prairie at Buzzard Roost Rock Preserve. The grasslands were all dominated by Andropogon gerardi, Andropogon scoparius, Sorghastrum nutans, and Bouteloua curtipendula and typical prairie forbs. Cladoniform lichens are now present at these sites and were noted, as well as the grasses, by E. L. Braun in 1928. Non-destructive sampling procedures were used in the study to determine density, frequency, cover and presence-absence data for the plants in each quadrat and also to study the quadrats themselves to analyze the microtopography. Soil samples were collected at each replicate and were tested for pH, % moisture, nutrients, texture and structure. Above ground biomass studies were completed for 50 replicates, half with and half without lichens. The presence-absence data showed no significant trends of association between the lichens and the other species using Cole's Index of Interspecific Association and Chi-Square analyses. The biomass differences within a species growing with or without lichens was also not significant, other than allowing for space to grow. All abiotic and species values were correlated by computer and the conclusions showed that the microtopography of the site was most significant in determining lichen presence.

2:00

EFFECTS OF CROP GROWTH ON CHANGES IN HEAVY METAL EXTRACTABILITY FROM A SOIL AMENDED WITH CD-ENRICHED SEWAGE SLUDGE. Peter H. Brown, Edward Zamierowski, Charles Ritter, and Charles Cothorn. Department of Biology, University of Dayton, Dayton, OH 45469.

A laboratory experiment was conducted to determine the effects of amending soil with a sewage sludge and crop growth on DTPA (diethylenetriaminepentaacetic acid)-extractable soil Zn, Cu, Ni and Cd concentrations. Sewage sludge from Dayton, Oh. was enriched with CdCl<sub>2</sub> during anaerobic digestion, increasing its Cd concentration by 1,000 ppm and giving a final Cd concentration of 1,414 ppm on a dry weight basis. DTPA-extractable metals were obtained from unamended, and sludge-amended Fox sandy loam (8.85 dry tons/acre) before and after growth of a seven-week crop of sugar beets (Beta vulgaris L.). Sludge application increased extractable soil Zn 30 to 40 times, Cu 3 to 10 times, Ni 4 to 6 times and Cd 12 to 18 times. The amount of extractable soil Cu and Cd increased, Zn decreased, and Ni remained the same following crop growth on sludge-amended soil. The data indicates that the forms of some metals in soil amended with sewage sludge change with time and crop growth, suggesting changes in the availability of metals to plants.

## ECOLOGY

2:15

CHROMIUM TRANSLOCATION IN PLANTS. Donna J. Pickrell, 1281 Henry Street, Zanesville, Ohio 43701

This experiment deals with soybean plants and radioactive chromium and iron. Two things were established: 1) Chromium concentrates quickly in plant roots, directly affecting the amount of iron a plant can absorb, regardless of the amount of iron available. 2) Metallic salts--such as chromium and iron salts--when applied to the leaves of plants under investigation can actually enter the plant system through the leaves and be translocated throughout the plant. This fact has not been established in the literature previously. Implications of this finding are far reaching, particularly in the fields of environmental toxicology and soil science.

2:30

EFFECTS OF POSITIVE AND NEGATIVE PHOSPHORUS STRESS ON AN OLD-FIELD ECOSYSTEM. Mark J. Knight, Institute of Environmental Sciences, Miami University, Oxford, Ohio 45056

The effects of contrasting phosphorus stress on an old-field ecosystem were investigated. A positive stressor (phosphoric acid fertilizer) and a negative stressor (DEF-6 herbicide) were applied to four 21.0 m x 30.5 m plots on 5 July 1977. Four control plots were also established. The producer trophic level served as the focus for analysis. Standing crop biomass (live), net primary production, litter decomposition, and seed production of the dominant plant species (*Setaria faberii*) were used to measure and evaluate ecosystem response. Standing crop biomass peaked on 2-3 September 1977 in treatment and control plots, with fertilized (positive) and control plots exceeding herbicide treated (negative) plots by 36.2 g/m<sup>2</sup> and 28.3 g/m<sup>2</sup>, respectively. Net primary productivity within positive and control plots exceeded that of negative plots by 0.9 g m<sup>-2</sup> day<sup>-1</sup> and 0.7 g m<sup>-2</sup> day<sup>-1</sup>, respectively, at the time of peak productivity, namely, 26-27 August 1977. The rate of litter decomposition was decreased in negative treated plots as compared to either positive or control plots throughout the study. Seed production of *S. faberii* in negative plots ( $\bar{X}$  = 73,923/m<sup>2</sup>) differed significantly ( $P < 0.05$ ) from positive plots ( $\bar{X}$  = 90,243/m<sup>2</sup>) and control plots ( $\bar{X}$  = 98,081/m<sup>2</sup>) in late August. Species diversity, species evenness, species richness, and dead plant material (detritus) will also be analyzed and discussed.

3:00

ROLE OF AUTOTOXICITY IN THE DISPERSION OF OSAGE ORANGE, *MACLURA POMIFERA*. Jeffrey L. Smith, Department of Botany, Miami University, Oxford, Ohio 45056.

Osage Orange has naturalized and become an important secondary successional species in southwestern Ohio. A key to understanding the ecology of this species is its seed dispersal mechanism. A typical fruit weighs from 200 to 400 grams and contains approximately 200 to 400 seeds. Dispersal of the intact fruits by wind or by animals does not appear to be a viable mechanism. Seeds of Osage Orange that were germinated and grown in soil containing different amounts of freeze-dried Osage Orange fruit pulp showed that seed germination is significantly enhanced by the fruit pulp. Seedling mortality is significantly increased with increasing fruit pulp concentrations. Extrapolation indicated that 100% seedling mortality should occur at fruit pulp concentrations of 15.1 grams. The amount of freeze-dried pulp in a fruit is estimated to be 50 to 92 grams. Studies on intraspecific competition of Osage Orange seedlings showed that Net Photosynthesis and Shoot Dry Weights are significantly decreased at a density of five plants. The high number of seeds per fruit is thought to attract animals which break apart the fruit to eat the seeds. The remaining seeds are dispersed during the break-up of the fruit. Seeds that are not eaten are thinned after germinating by the toxic factor in the fruit pulp, thus avoiding intraspecific competition. The surviving seedlings compete well with the native vegetation and naturalization of the species is achieved. Fruits which were not broken apart by animals have been found whose seeds did not germinate.

- 3:15 FEEDING ORIENTATION IN COMMON GARTER SNAKES, THAMNOPHIS SIRTALIS. Joan Oswalt  
Dept. of Zoology, Miami Univ., Oxford, Ohio 45056

Orientation of prey (fish) by eight neonatal common garter snakes, Thamnophis sirtalis, and the sensory cues involved in this orientation were examined.

Four of the snakes (controls) were fed symmetrical pieces of fish meat in which the "head" and "tail" ends were indistinguishable. The four experimental snakes were fed whole dead minnows. 72% of all minnows consumed were eaten head first. Head first ingestion required less time and was more likely to be successful than tail first ingestion. Orientation to the anterior end of the prey would serve an important ecological function—reducing exposure of the snakes to predation. However, attacks by the garter snakes were randomly directed and depended upon the approach of the snake to the prey. Swallowing duration decreased over time even though the number of attacks prior to swallowing did not change with experience. The body depth of the prey, within the scope of this experiment, did not affect the direction in which the prey was eaten. The position of the eye of the fish did not appear to be an important sensory cue in swallowing orientation.

- 3:30 REACTION OF CHIMNEY SWIFTS TO A CLOSED "CHIMNEY"  
Ralph W. Dexter, Dept. of Biological Sciences, Kent State University  
Kent, Ohio 44242

Chimney Swifts (Chaetura pelagica L.) nesting on the campus of Kent State University have been studied since 1944. Originally 88 air shafts on 4 of the older buildings were available for nesting. Eventually 41 were actually used by the swifts at one time or another. In recent years (mostly 1971-75) 30 "chimneys" have been closed, 14 of which had never been used by swifts, and of 16 formerly occupied shafts, only 5 were occupied the year before closing. Of 12 swifts barred from previously occupied air shafts, 5 nested in another shaft, 1 became a visitor with a pair in another shaft (subsequently nesting there the following year), 3 returned to the campus, but did not nest again, and 3 failed to return to the campus.

- 3:40 BIOENERGETICS OF CAPTIVE RACCOONS (PROCYON LOTOR). Victoria A. Teubner and Gary W. Barrett, Department of Zoology, Miami University, Oxford, Ohio 45056

Energy parameters of the raccoon (Procyon lotor) were measured and evaluated for twelve weeks beginning 1 September 1977 under penned laboratory conditions. Four raccoons (2 males, 2 females), each 14-16 weeks old, were maintained singly in kennel cages (63.5 x 63.5 x 63.5 cm) at the Miami University Ecology Research Center. Purina puppy chow, fruit cocktail, and peaches served as the food source during the study period. Water was provided ad libitum. Ingestion (food intake), egestion (feces), assimilation (ingestion-feces), secondary production (growth), and respiration (assimilation-growth) were computed daily for each individual. Mean values, expressed as kcal kg<sup>-1</sup> day<sup>-1</sup> were 217.0, 45.1, 171.9, 5.6, and 166.3, respectively. Mean assimilation efficiency (ingestion-feces/ingestion x 100) was 79.2 percent. This relatively low assimilation efficiency suggests that the raccoon functions at or near the primary consumer trophic level.

- 3:50 EFFECTS OF SEVIN ON EGG AND EGGSHELL CHARACTERISTICS OF COTURNIX QUAIL (COTURNIX COTURNIX JAPONICA). Pasquale D. Caprio, Department of Zoology, Miami University, Oxford, Ohio 45056.

Adult female Coturnix Quail were treated with 20, 40, or 400 ppm of carbaryl (Sevin insecticide) and changes in egg and eggshell parameters were monitored. Despite much daily variation, short term decreases in egg weight and volume were observed. Treated birds produced eggs with shells that differed little ultrastructurally from normal eggshells. No appreciable Sevin metabolites were detected in egg yolk 12 and 36 hours after treatments. No treatment or dosage effects were observed on egg shape, thickness index, crushing strength, or egg production. Crushing strength did not appear directly related to shell thickness, but may be a function of shell ultrastructure.

## ECOLOGY

4:05

PREY SELECTION AND BIOENERGETICS OF CAPTIVE SCREECH OWLS (*OTUS ASIO*). Janice L. Postler, Department of Zoology, Miami University, Oxford, Ohio 45056

This study was designed to measure and evaluate prey selection and bioenergetics of the Screech Owl (*Otus asio*) under semi-natural aviary conditions. Two adult Screech Owls ( $\bar{X} = 155$  g) were permitted to prey upon meadow voles (*Microtus pennsylvanicus*) and deer mice (*Peromyscus maniculatus*) within replicate aviaries (9.1 x 6.1 x 3.7 m each) located at the Miami University Ecology Research Center. Habitat modification provided for equal amounts (13.8 m<sup>2</sup>) of cover versus open space within each aviary. The study was conducted from 8-18 October 1977. Ten adult voles ( $\bar{X} = 36$  g) and ten adult deer mice ( $\bar{X} = 16$  g), 5 male and 5 female each, were introduced into each structure following a three-day acclimation period. Plotting the owls' feeding strategy resulted in a linear (continuous) prey selection pattern for *Microtus* in contrast to a bimodal prey selection pattern for *Peromyscus*. Mean daily ingestion rate was 0.57 kcal/g live wt/day. This value compares favorably with those ingestion rates previously reported for Screech Owls under natural conditions. Assimilated energy (ingestion-feces-pellets) was 0.43 kcal/g live wt/day. No significant weight gain was noted during the study. The Screech Owls exhibited a mean assimilation efficiency of 76% comparable to those values previously reported for predatory birds of similar size.

4:15

PREY SELECTION AND BIOENERGENICS OF CAPTIVE SCREECH OWLS. R. David Trumpy, Department of Zoology, Miami University, Oxford, Ohio 45056

This study is concerned with prey selection and bioenergenics of the Screech Owl (*Otus asio*) with emphasis on small mammal protective coloration. The study was conducted from 4-17 November 1977 at the Miami University Ecology Research Center. Two adult Screech Owls ( $\bar{X} = 168$  g) were allowed to prey upon two strains of deer mice (*Peromyscus maniculatus*), namely, the normal wild type and a mutant "blond" strain. Predation occurred under semi-natural conditions in a habitat dominated by giant foxtail (*Setaria faberii*). Vegetation was mowed to a height of approximately 8-10 cm to provide an "open," grassy-type habitat. Replicate aviaries (9.1 m x 6.1 m x 3.7 m) each contained ten (5 male, 5 female) wild-type *Peromyscus* ( $\bar{X} = 14.8$  g) and ten (5 male, 5 female) mutant "blond" *Peromyscus* ( $\bar{X} = 15.7$  g). The blond mutant strain was obtained from the John A. King Laboratory, Michigan State University, East Lansing, Michigan. All deer mice were allowed a three-day acclimation period before being subjected to predation. Based on data obtained from the initial seven feeding days, 62% of the mice taken were of the blond strain. During this 7-day period, the mean daily ingestion rate was 0.35 kcal/g live wt/day. This consisted of 0.13 kcal/g live wt/day of wild *Peromyscus* and 0.22 kcal/g live wt/day of blond *Peromyscus*. Mean assimilation efficiency (ingestion-feces-pellets/ingestion x 100) for the total 14-day study period was 77.4%.



## Poster Sessions

As an alternative to conventional podium or platform presentations the following papers will be displayed in poster form. Each presenter will be allotted one hour. This will permit informal and more in depth discussion with those most interested in the paper. Three papers will be presented concurrently at alternate numbered poster boards in Room 166 of the Physical Education Building. Your comments on this approach will be appreciated.

**9:00** REMARKS ON THE ANTARCTICA FIELD SEASON. David H. Elliot. Institute of Polar Studies, The Ohio State University, Columbus, Ohio 43210.

Abstract not available

**9:00** RECONNAISSANCE BORINGS IN QUATERNARY DEPOSITS OF "LAKE WILLARD," HURON COUNTY, OHIO. Szabo, J. P., Hodges, D. A. and Teeter, J. W., Department of Geology, University of Akron, Akron, OH 44325

Several reconnaissance borings and trenches across the Lake Willard Basin, Huron County, Ohio showed at least two tills and two glacio-fluvial sequences are present. The youngest glacio-fluvial sequence is overlain by marl and lacustrine silts correlated to classical Lake Willard, followed by organic soils, muck, and peat.

Wood from the upper part of the marl indicates that the lake possibly began to dry up or drain as early as 12,500 R.C.Y.B.P. Herbaceous silts and finally peat with a stump and log of *Thuja occidentalis* (northern white cedar) represents a swamp at 9,810 R.C.Y.B.P. Pollen is scarce in the marl, silts, and peat but some trends in vegetation are apparent. A mastodon bone date of about 9,000 R.C.Y.B.P. at a paleo-Indian site shows that Indians were living in the area. Silts overlying the peat may represent deposits during the Hypsithermal.

**9:00** TUNNEL VALLEY UNDER GLACIAL ICE IN WESTERN OHIO. Richard P. Goldthwait, The Ohio State University, 125 South Oval, Columbus, Ohio 43210.

The Kaiser Lake-Nettle Creek valley in western Champaign County has long been a puzzle because it crosses through a major drainage divide between Miami River and Mad River basins just north of St. Paris. With the recognition of vast meltwaters under pressure beneath all ice sheets, the origin of this "uphill" valley becomes apparent. As the Miami lobe 18,000 years ago hemmed in Kennard outwash in the interlobate Urbana area, water cut this valley up to a hundred feet deep where it escaped under ice southeastward to the interlobe. Then a millennium later the ice readvanced to Farmersville Moraine and boulder belt, filled the southeastern two thirds of this tunnel valley with kames rising 70 feet above Lake Kaiser, and spilled out a long valley train southeast to Mad River Valley outwash.

**10:00** COMPUTER SIMULATIONS FOR AN UNDERGRADUATE BIOCHEMISTRY LAB COURSE. Kenneth P. Klatt, Department of Biology, Denison University, Granville, Ohio 43023

Because of limitations of time or equipment, it is impossible to perform many important types of laboratory experiments in an undergraduate biochemistry course.

To substitute for such experiments, I have developed two computer simulations written in Basic Plus, and adapted for use on our Digital Equipment Company time-sharing computer at Denison. One of these simulations, titled "Prot," allows students to determine the molecular weight of a protein using a simulated sedimentation in an ultracentrifuge. The migration of the protein in the centrifugation field can be used to determine the molecular weight using the sedimentation velocity method. In the "Prot" simulation, the student supplies migration values and the computer calculates the apparent molecular weight and the theoretical stokes radius of the protein. Knowing these values, the students can predict the shape of protein. The second simulation, titled "Enz-control," allows the students to measure the effects of the energy charge (ratio of the adenylates - AMP/ATP) on the rates of certain enzymes. In this simulation, the students supply the energy charge values and computer calculates the rates of reaction for the biosynthetic enzyme aspartokinase and the catabolic enzyme phosphofructokinase under various environmental conditions.

## POSTER SESSIONS

10:00

FILTRATION RATES OF A SMALL SPHAERIID CLAM USING AN ACCURATE MICROASSAY. Richard B. Benjamin and Albert J. Burky. Department of Biology, University of Dayton, Dayton, Ohio 45469.

Filtration rates of the small freshwater sphaeriid clam, Musculium partumeium (Say), have been determined by its ability to clear 2.02 micron polyvinyltoluene (PVT) beads (Dow Chemical Corp.) from a dilute 20 ml suspension in filtered pond water. The animals are allowed to filter for 2-4 hours. Ten ml of PVT suspension is removed from each chamber and dried for 24 hours at 95 C (samples can be stored indefinitely). Dried PVT samples are dissolved in 2 ml dioxane and assessed spectrophotometrically at 267 mμ. Controls are treated as experimental chambers without clams. To correct for optical impurities found in experimental and control water, blanks are made by drying 10 ml of filtered pond water and extracting with 2 ml dioxane. Filtration rates are calculated according to the clearance equation of Barker Jørgensen. Adult clams filter between 0.75 and 2.0 ml·hr<sup>-1</sup>·mg dry body tissue<sup>-1</sup>, depending on temperature and season. Juveniles have a high rate in early spring (2.0-3.0 ml·hr<sup>-1</sup>·mg dry<sup>-1</sup>) but display "inactivity" in the summer and fall (about 0.25 ml·hr<sup>-1</sup>·mg dry<sup>-1</sup>). According to our assessment of filtration rates the clams cannot meet their energy requirements from the available suspension of food in their natural habitat. This suggests deposit feeding as an alternative strategy.

10:00

DYNAMICS OF EMBRYONIC GROWTH IN TWO POPULATIONS OF THE SPHAERIID CLAM MUSCULIUM PARTUMEIUM (SAY). C.M. Way, Daniel J. Hornbach and Albert J. Burky. Department of Biology, University of Dayton, Dayton, Ohio 45469.

Musculium partumeium, being hermaphroditic and viviparous, broods its young in marsupial sacs found in the inner branchial chambers of their gills. The embryos when ready for birth are passed out through the exhalant siphon as miniature adults. Reproductive adults were dissected to assess the size distribution of embryos. An adult usually contains several distinct developmental cohorts. Embryonic size ranges from <0.1 to 1.7 mm (greatest body dimension) although birth of cohorts usually occurs at 1.4 mm. One population of clams, from an ephemeral pond, shows one generation per year with brood development and birth in the spring before the pond dries. The other population, from a permanent pond, shows two overlapping generations per year with brood development and birth occurring in major pulses in the spring and fall. The growth rate of embryos ranges from 0.05 to 0.38 mm per week for both populations. Maximum brood size from the ephemeral and permanent ponds is 45 and 60 for adults of shell lengths 8.6 and 8.8 mm respectively. In early June the average number of embryos per adult from the ephemeral pond is 24.5 (Range:0-45); the average number of embryos per adult from the permanent pond is 11.7 (Range:0-27) and 34.3 (Range:21-60) for the two adult generations. There is approximately a 40% survivorship of visible embryos (≥0.1mm) to birth in the ephemeral pond.

11:00

THE RELATIONSHIP BETWEEN THE ORGANIC AND INORGANIC COMPONENTS OF THE SHELLS OF SPHAERIID CLAMS. Michele A. Anatra, Dennis M. Catalano and Albert J. Burky. Department of Biology, University of Dayton, Dayton, Ohio 45469.

Shells of populations of sphaeriid clams were analyzed for total organic carbon (μg C·mg shell<sup>-1</sup>, Range: 3.41-11.32), total nitrogen (μg N·mg shell<sup>-1</sup>, Range: 1.32-3.09) and CaCO<sub>3</sub> (%CaCO<sub>3</sub> of total clam dry wt, Range: 80.0-94.0). Water from each habitat was assessed for conductivity (μMHO, Range: 110-800), total hardness (measured as ppm CaCO<sub>3</sub>, Range: 63-446), ppm CaCO<sub>3</sub> (Range: 41-260), ppm MgCO<sub>3</sub> (Range:22-264) and suspended organic carbon (μg C·l<sup>-1</sup>, Range: 0-1864). Fourteen populations of clams were studied: six Sphaerium striatinum (Lamarck), three S. simile (Say), one Pisidium walkeri Sterki, three Musculium partumeium (Say) and one M.transversum (Say). There are no significant relationships between shell components and any of the assessed physical characteristics of habitat waters, nor are there any relationships between shell components and the trophic condition of habitat waters (assessed as suspended organic carbon). However, interspecifically and intraspecifically there is an inverse relationship between shell weight (%CaCO<sub>3</sub> of total shell and tissue dry wt) and the amount of shell carbon (linear regression: r<sup>2</sup> = 0.74) and between shell weight and the amount of shell nitrogen (linear regression: r<sup>2</sup> = 0.73). Shells of the genera Sphaerium and Musculium are at the upper and lower ends of the shell weight regressions respectively.

- 11:00** METHODOLOGY OF FOREST-SITE SELECTION FOR AIR POLLUTION STUDIES.  
Sreedevi K. Bringi. Atmospheric Sciences Program, 469/2015 Neil Ave, The Ohio State University, Columbus, Ohio 43210.

A methodology is developed to select suitable forested areas where meaningful assessments of air pollution effects on forests might be made. The approach is based on the premise that environmental influences can significantly affect the forest-air pollution relationship and that it is therefore desirable to normalize such influences at different sites. Relevant environmental factors such as terrain, forest types, climate and meteorology and their influences on forests, air pollution potential and sensitivities of forest species to air pollutants are reviewed. Various aspects of air pollution potential are also examined. Using existing data on environmental factors and air pollution potential, a general methodology based on manually overlaying transparent maps is developed to identify forested areas having common environmental characteristics and significantly different air pollution potential. The procedure is demonstrated by applying it to the State of Ohio where possible forest sites are identified in two counties experiencing significantly different air pollution potential. Several sites are also identified in the vicinity of a major point source.

- 11:00** PROBLEMS IN THE DESIGN AND EVALUATION OF AGRICULTURAL NONPOINT-SOURCE POLLUTION ABATEMENT PROGRAMS. David B. Baker and Jack W. Kramer, River Studies Laboratory, Heidelberg College, Tiffin, Ohio 44883

Significant reductions in the loading of phosphorus from agricultural lands to Lake Erie are deemed necessary for restoration of the lake. Since most agriculturally derived phosphorus entering the lake is adsorbed to suspended sediment, programs to reduce phosphorus loading are equated with regional sediment-yield reduction programs. Since regional sediment yields are generally a small fraction of the gross erosion occurring within the region (i.e. sediment delivery ratios may be 10% or less), design of erosion control programs to reduce sediment yields must consider the spatial variations in both gross erosion and sediment transport. A lack of quantitative data on the upland phases of sediment transport and on instream sediment delivery prevents the inclusion of potentially significant information for program design. Evaluation of the effectiveness of regional programs is difficult because of the large annual variations in sediment yields. These yield variations result from the annual variations in the temporal and spatial co-occurrences of rainfall, ground cover, soil moisture and other factors associated with erosional processes. In addition, the total residence time of sediment while in transit within large drainage networks is uncertain. The above problems in design and evaluation are illustrated with data from the Sandusky River Basin of Northwestern Ohio.

- 12:30** COST-EFFECTIVENESS TECHNIQUES FOR USE BY LAYPERSONS IN THE WEATHERIZATION OF HOMES OF LOW-INCOME FAMILIES. John Hagely, Thomas Martineau, Ellen Ramlet, Battelle-Columbus Laboratories, 505 King Avenue, Columbus, Ohio 43201.

A research program recently completed at Battelle has resulted in a procedure which permits laypersons to use limited cost-effectiveness analysis techniques in the weatherization of homes owned by low-income families in Ohio. Weatherization is a procedure whereby existing homes are made more efficient users of energy via the addition of insulation, weatherstripping, caulking, storm windows, and numerous other similar activities. A method was developed to permit persons performing weatherization actions to choose the most cost-effective combination of weatherization actions for each individual home under consideration. The persons using this method are employees of Community Action Agencies (CAAs), and have a diversity of training and skills, but are not generally versed in cost-effectiveness analysis. As a result, the method developed for use by the CAAs does not require any rudimentary computations, nor is it time-consuming or complex. Instead, a series of reference tables are provided which permit one to choose optimal amounts of insulation for ceilings, walls, floors, ducts and pipes, on the basis of local heating degree days, fuel cost, and type of insulating material. In addition, a table has been developed to let each CAA identify the most cost-effective insulation material in their area (cost per thermal resistance per inch). In combination, these tables permit the choice of the optimum thickness of the most cost-effective insulation for ceilings, walls, floors, ducts and pipes.

## POSTER SESSIONS

1:30

IMMUNOGENICITY OF GLUTARALDEHYDE TREATED AORTIC TISSUE. D. J. Slanczka and P.K. Bajpai, Dept. of Biology, University of Dayton, Dayton, Ohio 45469.

Experiments were designed to study the immunologic response of glutaraldehyde treated aortic valves using tissue extracts containing both soluble and insoluble fractions. Three rabbits in each group (2) were immunized with untreated aortic valve antigen (UAV) and glutaraldehyde-treated aortic valve antigen (GAV) in Freund's Adjuvant. Immunogenicity of whole tissue extracts was determined by *in vitro* Capillary Tube Precipitation Test (CTPT) and *in vivo* antigen challenge 10 weeks after the first immunization. CTPT showed that all the rabbits developed antibodies capable of precipitating the corresponding antigen. Differences in the amount of precipitating antibody produced by tanned and untanned tissues were not significant. Upon antigen challenge, all rabbits displayed a mild to drastic anaphylactic response characterized by changes in respiratory frequency and depth, height of P and R voltages, as well as incidences of nodal beats, atrial fibrillation, and premature ventricular contractions, or a combination thereof. GAV immunized rabbits reacted to approximately the same degree as rabbits immunized with UAV. This study indicates that glutaraldehyde-treated tissue is immunogenic, inducing precipitating antibody production as well as an anaphylactic-type response.

1:30

STRUCTURAL AND FUNCTIONAL COMPARISON OF MITOCHONDRIA ISOLATED FROM LIVER AND RaVe TUMOR IN DBA/1J MICE.

Gregory S. Bambeck, Raymond Gesinski, and Robert Heath  
Kent State University, Department of Biological Sciences, Kent, Ohio 44242

Mitochondria isolated by differential centrifugation from liver and reticulum cell sarcoma of DBA/1J mice implanted with RaVe tumor were compared to mitochondria isolated from livers of healthy mice of the same strain. Large structural and functional differences were observed between mitochondria isolated from tumor and mitochondria isolated from livers of either healthy mice or of tumor implanted mice. Mitochondria isolated from livers of all mice were structurally and functionally similar. Oxygen consumption, measured polarographically, demonstrated that tumor mitochondria consumed  $O_2$  5-10X slower than liver mitochondria. Mitochondrial composition, in terms of major polypeptides present in whole mitochondria, was determined by SDS polyacrylamide gel electrophoresis: 15 $\mu$ g/protein per gel, 8mA per gel. Of the 26 polypeptides consistently noted in the liver mitochondria (14 runs), six were reproducibly undetectable or significantly altered in tumor mitochondria (4 runs). One component in tumor was never found in liver. It is hypothesized that gross structural alterations of mitochondria in this tumor account for their functional alterations, and may be implicated in the highly elevated lipid stores previously described in RaVe tumor cells.

1:30

EFFECTS OF GLUTARALDEHYDE FIXATION ON THE DISTRIBUTION OF DFP-REACTIVE SITES IN MAMMALIAN LIVER. Y. A. Saturen, Dept. of Biology, Univ. of Toledo, Toledo, Ohio 43606 and G. C. Budd, Dept. of Physiology, Med. College of Ohio, Toledo, Ohio 43699.

Qualitative and quantitative effects of glutaraldehyde fixation were studied by morphometric and biochemical methods. Hepatic tissue for these experiments was obtained from sexually mature female Mongolian gerbils (*Meriones unguiculatus*). Tissue blocks (1 mm<sup>3</sup>) were incubated for 20 min. in <sup>14</sup>C-labeled diisopropylfluorophosphate (DFP, 10<sup>-4</sup> M) prior to or immediately following fixation in cacodylate buffered 3% glutaraldehyde. Some blocks were processed for light and EM microscopy. Other blocks were homogenized for scintillation counting or polyacrylamide gel electrophoresis (PAGE). The gels were stained for esterase activity. Radioautographs of microscopic sections were developed and hepatocyte grain densities were measured with an Omnicon image analyzer. Gel radioautographs were scanned by densitometry.

Based on scintillation counting, 55% of the DFP-reactive sites resist fixation. The PAGE data indicate that these sites correspond to esterase activity. The morphometric data show that the intracellular sites were also reduced (to 63%) but not redistributed following fixation. Studies are in progress to determine the nature of the hepatic esterases and their subcellular compartmentalization. (Supported in part by NIH Grant AM 16537 to G. C. Budd.)

2:30

INFLUENCE OF DIETARY Pb ON AVIAN FRACTURE HEALING. Milton A. Lessler.  
Department of Physiology, Ohio State University, Columbus, Ohio 43210

This study was designed to compare the metabolism of epiphysis, shaft, and callus in 2 week old chicks fed a normal diet or food containing 1% Pb acetate. The right radii of 6 day old Leghorn Chicks were fractured by digital pressure. The undamaged ulna acted as a natural splint, and the left radius was left intact as a control. On the 7th day post-fracture the chicks were decapitated and blood from the jugular vein was collected for Pb determination by Atomic Absorption Spectrometry. The right (fractured) and left (intact) radii were dissected free, sectioned into shaft, epiphysis, and callus and placed in ice-cold physiological saline. Bone sections were weighed, minced, and placed in 1 ml. of medium in a microchamber adapted to the YSI model 53 Biological Oxygen Monitor. After equilibration, oxygen uptake of individual samples was measured with an oxygen electrode. Chicks on the Pb-containing diet had blood levels of 227 to 800 µg Pb/dl while chicks on the normal diet had blood levels of only 8 to 16 µg Pb/dl. Pb-fed birds grew well but averaged 8.6% less weight gain than control chicks. Comparison of wet to dry weight of the samples showed little difference in calcification during the 7 day experimental period, but oxygen uptake measurements of callus samples showed a mean depression of 25% in Pb-fed birds. This result suggests that toxic levels of Pb tend to slow fracture repair by depressing the oxidative metabolism of growing callus and that this effect is less evident in the epiphysis and shaft of the bone.

2:30

DISSOLUTION OF BONE REBUILDING IMPLANT (SYNTHOS) S.A. Signs and P.K. Bajpai,  
University of Dayton, Dayton, Ohio 45469

Tricalcium phosphate ceramics (Synthos) have been extensively investigated as a material for replacing segments of bone. Implants of Synthos in bone show a gradual breakdown of the ceramic with passage of time and prominent infiltration of the ceramic pores with endogenous osteoid. This breakdown process of the ceramic is often referred to as resorption. Though the term resorbable has been long associated with Synthos ceramic, an accepted mechanism of the resorption process has not been elucidated. Thus, *in vitro* flow-through experiments were designed to gain an insight concerning the role played by chemical dissolution. Synthos ceramics (Miter Inc., Worthington, Ohio) were placed in an isolated chamber and exposed to a 1 ml/min. current of Tris HCL buffer (280 milliosmoles) at 37°C for 6-hour periods. Fractions of the effluent were collected at 30 min. intervals. Calcium in the solution was measured by Atomic Absorption Spectroscopy (Perkin-Elmer, Norwalk, Conn.) while phosphorus was determined by Gran's plot titration using a specific ion electrode (Orion Inc., Cambridge, Mass.). Duplicate sets of ceramics exposed to the flow-through system were removed at intervals and were processed for scanning electron microscopy. Fluid collected from the flow-through efflux showed marked release of calcium and phosphorus from the ceramic. Scanning electron micrographs of the ceramics exposed to the solution exhibited free granular particulates and precipitates within the ceramic pores. These results suggest that in solution, ceramics release particulates via breakdown of grain structure.

2:30

CARDIOVASCULAR RESPONSES TO THE COLD PRESSOR TEST. M.A.B. Frey, R.M. Siervogel,  
E.A. Selm, Wright State University School of Medicine, Dayton, Ohio 45435.

Six subjects of each sex participated in 4 experiments each involving limb immersion in cold (4°C) water. Conditions were varied in the 4 trials which were on 4 different days so each subject performed hand and foot immersion while seated and supine. Cardiovascular parameters noninvasively monitored during a resting control period and at 15-30 and 45-60 sec. of limb immersion were: systolic (SP) and diastolic (DP) blood pressures, heart rate (HR), ejection time (ET), time from Q wave of ECG to dD/dt maximum of carotid pulse contour, ratio of positive deflection of dD/dt to total positive + negative deflection (A/A+B), and transmission time to ear pulse monitored by photoelectric cell (TT). Responses were analyzed for effects of limb, posture, duration of immersion, and sex. There were significant differences between 15-30 and 45-60 sec. responses in SP, DP, HR, Q-dD/dt, and TT; however, limb or posture did not appear to influence responses. Preliminary analyses indicate there may be response differences between sexes. Reduction in A/A+B; shortened Q-dD/dt, which includes the isovolumic contraction period; and increased SP, DP, and HR occurred in both sexes with limb immersion. Shortening of ET occurred in the females as would be predicted with tachycardia; however, ET appeared to be prolonged in males, despite increased HR, possibly indicating increased stroke volume during cold immersion. The prolonged ET in males was accompanied by slower TT and increased amplitude of the ear pulse. These preliminary results are suggestive of sex differences in cardiovascular responses to cold, particularly with respect to stroke volume. (Supported in part by NIH (NHLBI) Grant R01-HL19931-01.)

## POSTER SESSIONS

3:30

CYTOGENETIC STUDY OF A PAEONIA CALIFORNICA INDIVIDUAL HAVING TWO RINGS-OF-FOUR AND ONE BIVALENT. Antonio A. Garabis and Elton P. Paddeock. Department of Genetics, The Ohio State University, 1735 Neil Avenue, Columbus, OH 43210.

An individual of Paeonia californica known to form two translocational rings-of-four (EM and MM) and one bivalent (D) was studied relative to the position and frequency of chiasma failure, and the frequency of alternate versus adjacent distribution. Study of the frequency of alternate-1 versus alternate-2 and adjacent-1 versus adjacent-2 was possible only in EM. All 406 first metaphase cells analyzed were on one slide. The most common configuration was chains-of-four (216 for EM, 162 for MM), i.e. one chiasma failure in each ring. There were 80 cells with both EM and MM as chains-of-four. The most common configuration of D was a rod (200) connected at its long arms. In EM, chiasma failure occurred most often at Position 4 between the short arms of the two E members. Mean chiasma failures in the 406 cells were:  $1.31 \pm 0.05$  in EM,  $1.65 \pm 0.05$  in MM, and  $0.87 \pm 0.03$  in D. There were 158 adjacent distributions in 138 cells, i.e. 20 cells had both EM and MM with adjacent distribution. In EM, adjacent-2 occurred twice as often (69:28) as adjacent-1, but alternate-1 equally (93:75) as alternate-2. In EM (168:97) and in MM (135:61) alternate occurred about twice as often as adjacent.

3:30

OSMOTIC FRAGILITY OF ERYTHROCYTES FROM MICE INOCULATED WITH A LYMPHOBLASTIC LYMPHOMA. J. L. Wasson, R. M. Gesinski, and R. T. Heath, Dept. of Biological Sciences, Kent State University, Kent, Ohio 44242.

Changes in erythrocyte osmotic fragility were observed by exposure to a hypotonic culture medium over time. Visual microscopic methods were used. With the passage of time it became evident that erythrocytes obtained from mice inoculated with a lymphoblastic lymphoma were more susceptible to hemolysis than cells of normal mice. Erythrocytes from inoculated mice were found to be 25% more fragile than red blood cells from normal mice. Based on this observation studies are being conducted to investigate the possibility of a decrease in the lipid composition of the erythrocyte membrane as a contributing factor in the increased osmotic fragility.

3:30

THE TERATOLOGICAL EFFECTS OF DIPHENYLHYDANTOIN (DPH) IN A/J MICE. Charles E. Witkowski and Martha E. Sucheston\*. Department of Anatomy, The Ohio State University, 333 W. 10th Avenue, Columbus, Ohio, 43210.

It has been noted that the frequency of congenital malformations was greater among offspring that were born to epileptic mothers who received anticonvulsive therapy. The purpose of this study was to investigate the induction of cleft lip and palate by the anticonvulsant drug, diphenylhydantoin (Sodium, 5,5-diphenyl-2,4-imidazolidinedione) in A/J mice. Thirty pregnant female mice were injected on days 11, 12 and 13 with 50mg/kg (10X human dosage) diphenylhydantoin. This group was compared with 10 control animals, five males and five pregnant females, which received distilled water injections. On day 18 of gestation all pregnant mice were sacrificed by cervical dislocation. The fetuses were removed and processed as follows: 1) fixed in 10% neutral formalin, 2) examined using the dissecting microscope for evidence of any external congenital malformation, 3) dissected according to Wilson's method for detecting malformations in experimental animals and 4) the head was then serially sectioned and stained with azan for examination by light microscopy. Study of 247 fetuses of treated mothers revealed: 14 cleft lips (5.6%); 10 cleft palates (4.0%); and 17 cleft lip with cleft palate (6.9%). Orofacial defects were not found in the control group. Thus, treatment of pregnant mice with DPH during late embryogenesis effected a statistically significant increase of orofacial malformations.